

BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1931 ROYAL BOTANIC GARDENS, KEW

I.—SOME INDIAN RHODOPHYCEAE ESPECIALLY FROM THE SHORES OF THE PRESIDENCY OF BOMBAY. F. BOERGESEN.

The present paper deals with some new or interesting *Rhodophyceae* selected from my collection of Marine Algae made in India during my stay there in the winter 1927-8. Most of the species mentioned originate from the very interesting algal locality at Dwarka, at the entrance to the Gulf of Cutch, where a rich algal vegetation covers the rocky shore and the bottom of the rock pools. A fine sublittoral algal vegetation is, I feel sure, also present. I tried on one occasion to dredge, but it was difficult because of the turbulent sea and even more so owing to the available boats being too large and heavy.

At Okha Port, about 20 miles north of Dwarka, a very rich sublittoral algal flora was found. One day, on visiting this place, I found algae cast ashore quite fresh and lying scattered in immense quantities upon the sloping sandy beach and evenly spread out, so that it was an easy task to collect.

For some time I had my headquarters in Bombay, and some algae from here, and from Carwar near the southern limit of the Presidency, are included.

In addition to the above, reference is made to a few algae from Karachi. I had, unfortunately, no opportunity to visit this locality which, as regards algae, seems to be very interesting. The Director of the Royal Botanic Gardens, Kew, has, however, given me the privilege of examining a large collection from this place, mostly gathered by Vice-Admiral W. J. S. Pullen about 1860 and by James A. Murray in the years 1880-1883. Mr. K. G. Naik, of D. J. Sind College, Karachi, has, moreover, most kindly presented me with a collection of various algae from this locality, preserved in spirit.

Apart from papers on Ceylon algae, it is many years since a paper of any significance was published on Indian seaweeds, and unfortunately most of the published MS. lists available in herbaria are based on scrappy or non-characteristic material collected on odd occasions, usually by persons who were not algologists. Many of the names listed are, in the light of modern knowledge, quite erroneous, and there is indeed at the moment very little definite information as to what algae (apart from cosmopolitan species) actually occur on the shores of the Presidency of Bombay and in the Arabian Sea. References to such published lists as exist will be found

in a paper by Prof. M. O. P. Iyenger entitled "Algal Work in India" (Proceedings of the Fifteenth Indian Science Congress, 1929, p. 207). It is hoped that this communication and others which may be published in the *Kew Bulletin* and elsewhere will assist in laying the foundation of a more correct knowledge of the marine flora of this interesting region.

It is early to make general observations based upon my collections, but there is one interesting fact which I wish even at this stage to point out, namely, that in the collections of algae from the north end of the Arabian Sea (viz., Dwarka, Okha Port, and Karachi) several species are found which are the same as (or if not, very closely related to) species from Australia. In the hot belt between these two localities these species appear to be wanting.

To the Director of the Royal Botanic Gardens, Kew, I am greatly indebted for having afforded me facilities for publication in the *Kew Bulletin*, and I have also to thank Mr. A. D. Cotton for his valuable help. The type specimens of new species described in this paper are preserved in the Botanical Museum, Copenhagen.

BANGIACEAE.

Erythrocladia subintegra *Rosenvinge* Mar. Alg. Denm., i. 73, figs. 13-14. Boergs. Mar. Alg. D.W.I. ii. 7, figs. 3-4.

Several discs of an alga which I think is referable to this species were found. The young plants are regularly formed and agree well with my figures (*l.c.*, 3 *a* and *b*). The older thalli are more irregular, having a very uneven margin. The largest discs seen were only about $8\ \mu$ broad. The peripheral, cylindrical, often forked cells are about $3\ \mu$ thick. The shorter, oblong or more irregular formed cells are a little broader in the middle. In some of the specimens sporangia were present.

INDIA : Carwar. On *Padina tetrastrumica* near low water mark.
Distr. Danish Waters, West Indies, Macassar.

HELMINTHOCLADIACEAE.

Acrochaetium crassipes Boergs. Mar. Alg. D.W.I. ii. 20, figs. 11-12. *Chantransia crassipes* Boergs. in Bot. Tidsskr. xxx. 1 (1909).

var. *typica* Boergs., *l.c.*

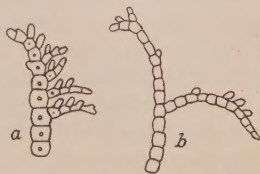


Fig. 1. *Acrochaetium crassipes* Boergs. ($\times 250$).

Of this epiphyte I found a few specimens growing upon *Heterosiphonia Muelleri* and *Polysiphonia ferulacea*. The specimens on the former (fig. 1a) reached a height of about $65\ \mu$; the basal cells had a

diameter of 10-11 μ , the branches tapering gradually upwards to 5-6 μ . The sporangia were 8-9 μ long and 5-6 μ broad. No hairs were present. Each cell had a large central pyrenoid, but the shape of the chromatophore could not be seen.

The specimens upon *P. ferulacea* (fig. 1b) were more slender. The thallus reached a height of 80 μ and the filaments had a diameter of 6-7 μ at their base and 5-6 μ at the summit.

The plant was originally described and known only from the West Indies, but an *Acrochaetium* referred to the nearly related *A. catenulatum* Howe has been found by Mme. Weber at Macassar (Algues du Siboga, p. 193).

INDIA : Dwarka, epiphytic on Florideae.

***Liagora ceranoides* Lamx.** Hist. Polyp. corall. flex. 239 (1816). Howe, Algae, in Britton and Millspaugh, The Bahama Flora, 555 (1920). Boergs. Mar. Alg. Canary Isl. iii. Rhodophyceae, Part i. 58. *L. pulverulenta* Ag. Spec. Alg. i. 396. Boergs. Mar. Alg. D.W.I. ii. 80, figs. 87-92. *L. leprosa* J. Ag., Alg. Liebm. 8.

The Indian specimens appear to agree with those from the West Indies and Canary Islands and with my figures quoted above.

The cells of the assimilating filaments are narrow almost cylindrical below, shorter and broader upwards and nearly globular at the periphery. The rather vigorous carpogonial branch is developed on one of the uppermost cylindrical cells and is provided with a very long thin trichogyne. The cystocarps agree with my figure 90d. Long hairs like those found in the West Indian plant (fig. 92c) were common. Female plants only were found.

INDIA : Dwarka, in rock pools near low water mark.

Distr. West Indies, Canary Islands, Red Sea, Dutch East Indies, etc.

***Galaxaura oblongata* Lamx.** Hist. corall. 262. Boergs. Mar. Alg. Canary Isl. iii. Rhodophyceae, Part i. 71 (full synonymy). *Corallina oblongata* Ellis et Solander, Nat. Hist. Zoophytes 114, tab. 22, fig. 1.

After having compared the Indian specimens with my Canary and West Indian material I have come to the conclusion that it is impossible to separate the former from those of the Atlantic Ocean. In the Indian specimens the segments are about 1-1.25 mm. (up to 2 mm.) broad, thus approaching the broad form found in the Canary Islands. The length of the segments is about 0.5-0.75 cm. rarely more, thus agreeing well with the Canary specimens. The anatomical structure of the thallus also agrees. The surface cells have a diameter of about 12-14 μ and the innermost and largest cells of the short assimilating dichotomous filaments below measure 30 μ in breadth. All the specimens seen were sexual.

It will be noted that the specimens with the thickest thallus reach the breadth which Kjellman records for *Galaxaura Schimperii* Dcne., a plant of which I have seen no authentic specimens. According to Kjellman's description [Kgl. Svenska Vet.-Akad. Handl.

xxxiii. 61 (1900)] and figures, I have, however, no hesitation in referring this species also to *Galaxaura oblongata*.

A bleached specimen in the Kew Herbarium, gathered by J. A. Murray at Karachi, and named *G. annulata*, is referable to the present species.

INDIA : Dwarka, in deep rock-pools, Karachi, J. A. Murray.

Distr. West Indies, Canary Islands, Mediterranean Sea, Red Sea, Indian Ocean, Japan.

Scinaia indica Boergs., sp. nov. ; a *Scinaia moniliformi* J. Ag., facie persimili, articulis subovalibus, axi centrali obscuro, utriculis angustioribus inter alia recedit.

Frons atropurpurea, cylindrica, identidem furcata et regulariter articulata constricta, circiter 17 cm. alta et ultra, articulis magnitudinis variabilis, ovalibus paene subcylindricis, 4–5 mm. latis, 5–15 mm. longis, cystocarpiis dispersis oculo nudo visibilibus. *Axis* centralis obscurus. *Utriculi* longi et angusti, 40–45 μ longi, 17–21 μ lati, cellulis epidermidis globosis pyriformibus, circiter 16 μ latis, coloratis. *Cystocarpia* globosa-pyriformia, circiter 250 μ lata.

INDIA : Dwarka, dredged at a depth of about 10 metres ; Okha Port, cast ashore. *Boergesen* 5479 (type).

Plant when fresh, red ; when dried, in the lowermost part black-red, paler red upwards, about 17 cm. high, repeatedly and regularly forked and very regularly deeply constricted (Plate I. fig. 1). Joints

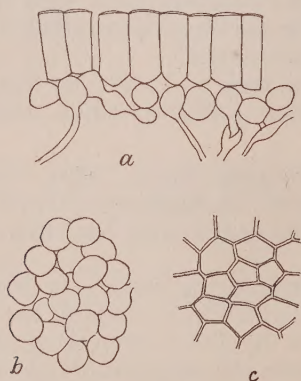
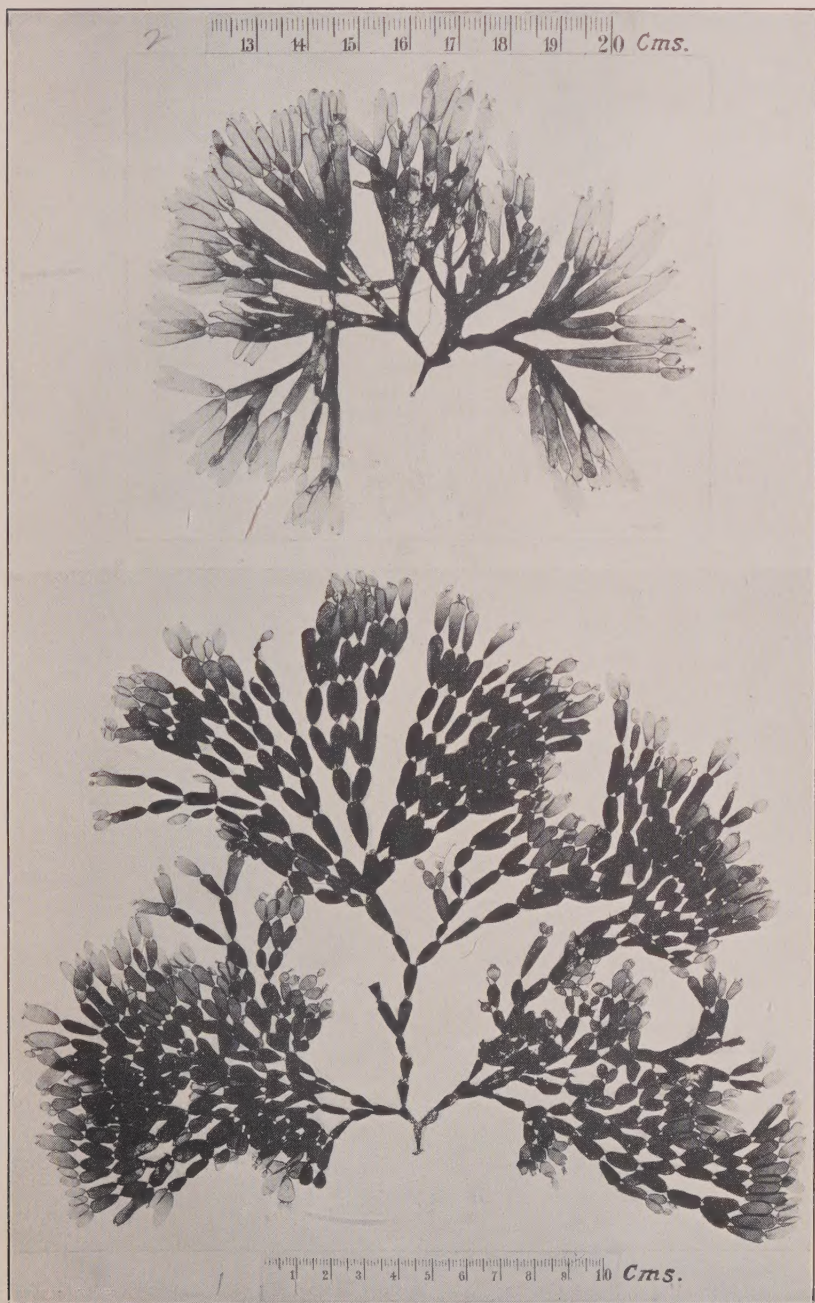


Fig. 2. *Scinaia indica* Boergs. a, transverse section of thallus ; b, coloured, subepidermal cells seen from above ; c, peripheral cells seen from above. ($\times 265$).

of variable size : in living specimens (or in spirit-material made turgescient with water) some subcylindrical with broader rounded apex and attenuated base up to about 15 mm. long and 4–5 mm. broad, others shorter oblong-oval or almost as long as broad, 5–6 mm. long and 4–5 mm. broad. In dried material the joints become broader (up to 6 mm.), broadly rounded above, less so below. The cystocarps are scattered over the surface of the joints. The

PLATE I



Lower, Fig. 1. *Scinaia indica* Boergs.
Upper, Fig. 2. *Scinaia Hatei* Boergs.



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peripheral colourless cells (Fig. 2a) are about 40–45 μ long and 17–19 μ rarely up to 21 μ broad; seen from above their outline is polygonal (Fig. 2c). Between these a few narrow coloured cells are present. The assimilating cells below are nearly globular (Fig. 2a, b) or shortly pyriform, about 16 μ broad. They form a rather dense layer. To these cells the colourless filaments composed of long cylindrical cells are attached, traversing the mucilage-filled cavity in the middle of the joints. The axial strand is not visible in dried material or in material preserved in spirit except quite near the constrictions, where the filaments approximate closely and form a visible axis. The filaments are very variable in breadth, being from 2 μ to 12 μ thick. The cystocarps, which were found in January, are roundish pyriform about 250 μ broad.

This new species comes near to the Australian *S. moniliformis* J. Ag. but shows nevertheless essential differences. We have in the Botanical Museum of Copenhagen a specimen of the Australian plant collected by J. Bracebridge Wilson at Port Phillip Heads—the same collector and the same locality as those of J. Agardh's type. This species differs from *S. indica* in the presence of a very clearly visible axial strand running throughout the plant, and in the shape of the joints which are more angular and almost cuneate. The epidermal cells are moreover almost square in the Australian plant (compare Setchell, The *Scinaia* Assemblage, p. 105, pl. xii. fig. 32). Finally, the Indian plant seems to be larger, more ramified, and on the whole a stouter and more firmly built plant, and this, coupled with its distinct geographical distribution, warrants its being considered as a distinct and new species.

Scinaia Hatei* Boergs., sp. nov.; *Scinaiae articulatae* Setch. proxima, quae tamen thallo magis regulariter constricto, axi centrali conspicuo, utriculis latioribus et brevioribus a specie nostra distincta est.

Frons roseo-rubra, cylindrica, circiter 9 cm. alta, 2–5 mm. lata, identidem furcata et dichotomo-fastigiata, hic illic ad basim furcationis constricta. *Rami* inferne plus minus leviter attenuati. *Axis* centralis obscurus. *Utriculi* circiter 23 μ lati, 31 μ longi; cellulis epidermidis pyriformibus, circiter 13 μ latis 23 μ longis, coloratis. *Cystocarpia* oculo nudo visibilia, globoso-pyriformia, circiter 265 μ lata.

INDIA: Dwarka, in rock pools near low water mark, *Boergesen* 5391. Okha Port, east ashore, *Boergesen* 5484 (type). Karachi, W. J. S. Pullen (Herb. Kew.).

The colour of the plant (Plate I. fig. 2) is deep rose. The tallest specimens collected reached a height of 9 cm. The cylindrical thallus is from 2 to 5 mm. thick and is repeatedly forked and generally but not always constricted at the joints (Fig. 3). The segments are

* Named in honour of Professor Vinayak N. Hate of Wilson College, Bombay, whose great interest in the algological investigation of India made it possible for me to go to India and collect during the winter 1927–28.

elongated, cylindrical, of variable size, as often no constrictions are present at their base; as a rule they taper a little below, and are broadly rounded or somewhat emarginate at their upper ends. The axial strand is not visible in dried specimens, but is clearly seen in spirit-material.

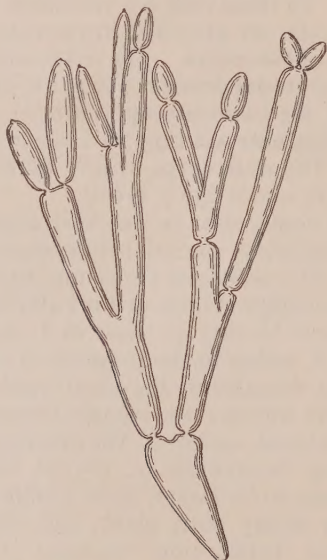


Fig. 3. *Scinaia Hatei* Boergs. Part of thallus ($\times 1\frac{1}{2}$).

The colourless epidermal cells (Fig. 4a) are flattened above, rather broad, about $23\ \mu$ broad and $31\ \mu$ long, seen from above 5-6-sided (Fig. 4b). Narrow coloured cells occur scattered among the colourless ones and some of these have antheridia.* The assimilating cells (Fig. 4c) are pyriform, about $13\ \mu$ broad and $23\ \mu$ long, as a rule forming only a single layer, rather loosely packed. The axial strand is about $230\ \mu$ thick and composed of thin filaments densely woven together. Most of the filaments are $3-4\ \mu$ broad; they consist of long cylindrical cells occasionally forked. The cavity in the middle of the joints is filled with mucilage, through which the filaments run in all directions and connect with the cells of the cortical layer. The cystocarps are roundish-pyriform, about $285\ \mu$ long and $265\ \mu$ broad.

S. Hatei was found in two forms, a slender one (gathered at Dwarka) the thallus of which only reached a breadth of about $1.5-3$ mm., and one from Okha Port more robust and stout with a thallus measuring $3-5$ mm. in breadth.

* Compare Svedelius, N., Zytologisch-entwicklungsgeschichtliche Studien über *Scinaia furcellata*. Ein Beitrag zur Frage der Reduktionsstellung der nicht tetrasporenbildenden Florideen. (Nova Acta Reg. Soc. Sci. Upsal. Ser. 4, iv.; Upsala, 1915).

In the collection of algae from the Kew Herbarium a fine specimen of this species is present, collected at Karachi in December, 1859, by W. J. S. Pullen.

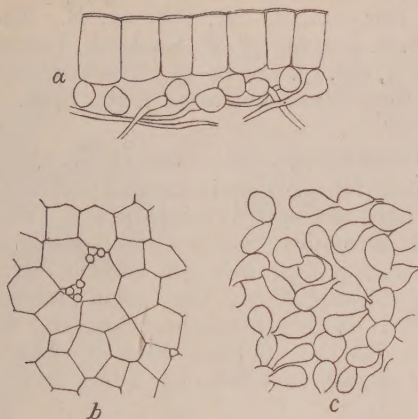


Fig. 4. *Scinaia Hatei* Boergs. a, transverse section of thallus; b, epidermal cells seen from above with antheridia; c, subepidermal assimilating filaments. ($\times 265$).

Scinaia Hatei is most nearly related to *S. articulata* Setchell (The *Scinaia* Assemblage, p. 109, plate xiii. figs. 39, 40). This species differs from our plant in the more regularly constricted thallus, the segments being usually a little narrowed near their upper ends, the axial strand being visible in dried specimens, and the utricles being broader and shorter.

Helminthocladia australis Harvey, Phycologia australica v. tab. 272. J. Agardh, Epicr. 506; Till Algeries System. xi. 39. De Toni, Syll. Alg. iv. 83. Okamura, Icones of Japanese Algae iv. tab. 156 (figura sinistra).

Two specimens of this plant were found, neither being attached to its substratum. One of these closely resembles Harvey's figure quoted above. The main stem when dried is about 3 mm. thick, and the branches about 2 mm., slightly attenuated at the base, and some of them branched as Harvey shows, but mostly simple. The other specimen has a thicker main stem, and is proliferous and very much branched, thus coming near to the plant figured by Okamura. The species is certainly very closely related to (if not identical with) *H. purpurea*, as pointed out by Harvey himself and later by Okamura.

The anatomical structure seems to agree with that of *H. purpurea* as described by L. Kolderup Rosenvinge (Mar. Alg. Denm. i. 47). According to Rosenvinge that species is monoecious, but the specimens of *H. australis* examined by me have shown only female organs.

INDIA: Okha Port, cast ashore.

Distr. Australia, Japan.

Chrysymenia Uvaria (L.) J. Ag. Alg. mar. Mediterr. et Adriat. 106; Epicr. 324; Florideenes Morphologi, tab. xvi. figs. 20-22. Harvey, Nereis Bor.-Am. ii. 191, tab. xx. B., figs. 1-3. Boergs. Mar. Alg. D.W.I. ii. 402, fig. 38. P. Kuckuck, Untersuchungen über *Chrysymenia* p. 214, tab. 13, figs. 14-15. *Fucus Uvarius* L. Syst. Nat. ii. 714 (1767). *Gastroclonium Uvaria* Kütz. Spec. Alg. 865; Tab. Phycol. xv. tab. 97.

forma **luxurians** Boergs., n.f. (Plate II. fig. 1).

The Indian plant far surpasses in size and luxuriance of the vesicles all other forms I have seen of this variable plant. While *Chrysymenia Uvaria* in the Mediterranean Sea is a small plant rarely exceeding, according to Kuckuck, 5-6 cm. in length, and the West Indian material reaches a length of about 20 cm., the Indian plant is often as much as 50 cm. long. It is very much branched and the branches are densely covered with the vesicles. Most of these are small, only 1-2 mm. broad, but they vary from 1 to 4 or 5 mm.

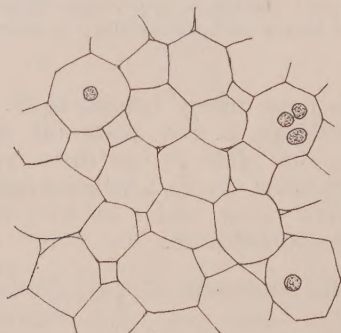


Fig. 5. *Chrysymenia Uvaria* (L.) J. Ag. Cells facing the cavity, some with gland-cells. ($\times 144$).

The anatomy agrees well with that of the West Indian specimens as described by me. Towards the cavity in the interior of the vesicles, some of the large cells bear here and there a globular gland-cell (Fig. 5). These are fairly regularly distributed. They are nearly always borne singly on each of the larger cells; very rarely two or three are found on the same cell. All the specimens gathered were sterile.

On account of its size I propose to call this stately plant f. *luxurians*.

INDIA: Dwarka, in the lowest part of the littoral zone or sublittoral. Karachi, J. A. Murray (Herb. Kew.).

Distr. Warmer part of Atlantic Ocean, Mediterranean Sea, Japan, Australia.

PLATE II



Upper Left, Fig. 1. *Chrysomenia Uvaria* J. Ag., f. *luxurians*.

Upper Right, Fig. 2. *Heterosiphonia Muellerei* De Toni.

Lower Right, Fig. 3. *Myriogramme okhaënsis* Boergs.

Lower Left, Fig. 4. *Myriogramme bombayensis* Boergs.

Coelarthrum Muellerei (Sond.) Boergs., comb. nov. *Lomentaria* (*Gastroclonium*) *Muelleri* Sonder in *Linnaea* xxv. 693 (1852). *Chylocladia Muellerei* Harv. *Phycol. austral.* iii. tab. 138 (1860). *Lomentaria valida* Kütz. *Tab. Phyc.* xv. tab. 85 (1865). *Chylocladia* (?) *valida* (Kütz.) J. Ag. *Till Algernes Systematik* xi. 24 (1890). *Erythrocolon Muellerei* (Sond.) J. Ag. *Epicr.* 302; *Anal. Algal. Cont.* iii. 91 (1896). De Toni *Syll. Alg.* iv. Sect. ii. 585. Okamura, *Illustr. Mar. Alg. Japan*, i. no. 4, tab. 16.

Before pointing out my reasons for referring this species to the genus *Coelarthrum*, I shall give a short description of the plant. I base this partly on some large specimens from Karachi from the Herbarium of the Royal Botanic Gardens, Kew, and partly on a fine specimen from the same locality which Mr. A. B. Kotwal, Karachi, has most kindly sent to me. As regards the anatomy I refer to a small piece of a plant which Mr. K. G. Naik, Sind College, Karachi, was good enough to give me.

The largest specimens seen reached a height of 25 cm. The thallus is jointed and fairly regularly di-trichotomously divided. The joints are hollow, whereas the short stem-like parts between the joints are solid. They are of variable size, oval cylindrical-cuneate, reaching a breadth of about 3–6 mm. and a length of from 0.5 cm. to 2.5 cm. The narrow part between the joints may reach a length of 2 mm., but as a rule it is quite short. Its breadth is about 0.5 mm.

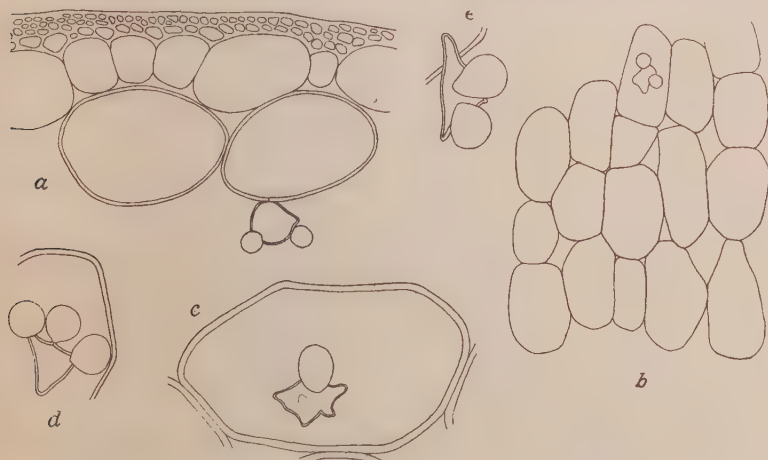


Fig. 6. *Coelarthrum Muellerei* (Sond.) Boergs. a, part of transverse section of thallus; b, the large cells seen from the cavity; c, d, e, large cells with stellate cells bearing gland cells. (a, c, d, e, $\times 144$; b, $\times 60$).

As to anatomical structure, a transverse section (Fig. 6a) of the hollow joints shows that the wall is composed on the inner side of large roundish cells. Seen from above these cells (Fig. 6b) are oblong-polygonal, reaching a length of about $250\ \mu$ and a breadth

of about 200 μ . Above these some smaller roundish cells are found and these, at the periphery, are covered by a layer of cortical cells. The last mentioned are when seen from above roundish-polygonal and have a diameter of about 8 μ . Occasionally, towards the cavity in the interior of the joints, one of the large cells is provided with an irregularly stellate smaller cell upon which 1-3 globular or pyriform gland-cells are placed (Figs. 6a-e). As mentioned above the narrow part of the thallus between the joints is solid. A longitudinal section (Fig. 7) shows that it is composed of parenchymatous tissue of longer narrow cells in the middle and small cells towards the periphery; it is formed very similarly to the solid stipe at the base of the vesicles of *Chrysomenia Uvaria* (compare Kuckuck, Beiträge zur Kenntnis der Meeresalgen 10-13, Fig. 5). The material in spirit was sterile, but one of the dried plants bore cystocarps which occur scattered over the surface of the thallus. Tetrasporic specimens I have not seen, but Okamura (*l.c.*) gives a figure of tetrasporangia and states that they occur densely scattered over the surface of the joints.

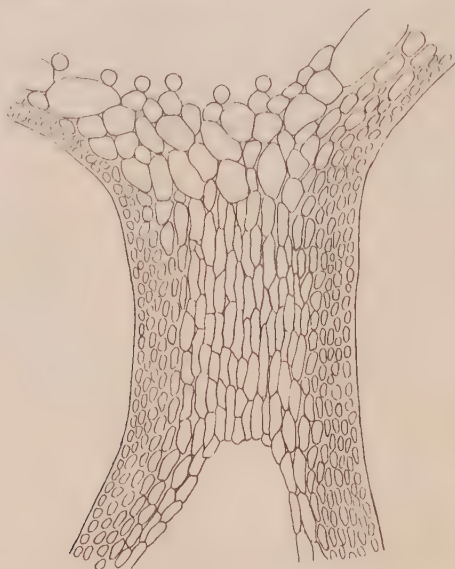


Fig. 7. *Coelarthrum Muelleri* (Sond.) Boergs. Longitudinal section of the narrow part of thallus between the joints. ($\times 69$).

It is obvious from this description that the thallus-structure of this plant is in agreement with that of *Coelarthrum Albertisii* (Picc.) Boergs. from the Atlantic Ocean except that, in the latter plant, the narrow portions between the joints are broader, and the joints (in the material I have examined) are separated by diaphragms composed of 1-2 layers of cells only, while in the Indian species the narrow part between the joints consists of a parenchymatic tissue.

In referring this plant to Sonder's species I must point out that I have had no authentic specimens of the Australian plant with which to compare it. But I think that it shows so much likeness to the published figures that no doubt is possible. Nevertheless, some differences between the two are present, namely the more marked monopodial ramification in the Australian plant (due to the fact that the ramification is most often trichotomous and the middle shoot becomes the most vigorous and continues the main axis) and the numerous proliferations which grow out from both sides of the thallus. The Japanese form, as figured and described by Okamura, shows marked main branches and numerous proliferal branches, and has more cylindrical and longer joints which reach a length of more than 5 cm. (compare also Okamura's specimens, *Algae Exsicc. Jap.*, no. 65).

With regard to the removal of this species from the genus *Erythrocolon* J. Ag. to the genus *Coelarthrum* Boergs., I should point out the following facts. The name *Erythrocolon* was first proposed by J. Agardh (in Grunow, *Algen der Fidschi-, Tonga- und Samoa-Inseln*, 1874, p. 33) as a name for a "sectio" of *Chylocladia* comprising *Chylocladia podagrica* Harv. and *C. Cliftoni* Harv., these species being characterized by the presence of big lacunae in the peripheral small-celled tissue (compare figure of *C. Cliftoni* in Harvey, *Phyc. Austral.* tab. 57, fig. 3, to which J. Agardh refers). Later J. Agardh (*Epicr.* 302) adds *C. Muelleri* Sond. to this subgenus. In *Analecta Algologica*, Cont. iii., he raises *Erythrocolon* to generic rank, the characteristic species being the two above-mentioned species of Harvey's, and points out at the same time that *C. Muelleri* has a different structure. I am now able to show that this structure with the characteristic starlike cells provided with glands is typical of *Coelarthrum* and the natural place of *C. Muelleri* must certainly be in this genus.

In my paper, "Some new or little known West Indian Florideae" (Part ii. 191-2), I have mentioned the genera related to *Coelarthrum* and the characters which distinguish them from it, which briefly stated are as follows. *Chrysymenia* differs in its ramification, its flattened non-constricted thallus, and the absence of stellate cells bearing gland cells. *Bindera* differs in the absence of diaphragms and by the tetrasporangia being placed in groups. *Champia*, *Lomentaria* and *Chylocladia* have characteristic longitudinal filaments running along the inner side of the joints, and it is upon these filaments that the gland cells are placed.

INDIA: Karachi, 1881, *J. A. Murray* (*Herb. Kew.*); *A. B. Kotwal*; *L. Hare* (*Herb. Kew.*); *K. G. Naik*.

Distr. Australia, Japan, India.

CERAMIACEAE.

Griffithsia tenuis *C. Ag. Spec. Alg.* ii. 131. *J. Ag. Spec. Alg.* ii. 84; *Epicr.* 70. Collins et Hervey, *Alg. Bermuda* 135, tab. vi. figs. 38-39. Boergs. *Mar. Alg. D.W.I.* ii. 462, fig. 423. *G. thyrsigera*

Askenasy, Forschungsreise "Gazelle," iv. Theil, Bot., 36, tab. ix. figs. 1 and 4. *Callithamnion tenue* Harvey, Nereis Bor.-Am., part iii. 130.

In a mixed collection of algae in spirit, tetrasporic specimens of this species were found. It is rather a robust form, the cells in the basal part of the filaments measuring up to $350\ \mu$ wide and those near the apex as much as $150\ \mu$ thick. As is stated by Askenasy (*l.c.*; compare also Boergs. *l.c.* fig. 423), the branches are not given off from the upper end of the cells but near their basal transverse walls. In the Indian plant adventitious filaments are often found issuing from the older cells and these filaments occur near their proximal end.

The ring of pedicellate tetrasporangia consists of from 8 to 16 (or even more) sporangia. The pear-shaped or clavate pedicel is about $140\ \mu$ long and about $70\ \mu$ broad above and half as broad at the base. A two-celled pedicel was once noted. A tetrasporic plant was gathered in January and the tetraspores measure $80\text{--}100\ \mu$ in diameter.

INDIA: Dwarka, on exposed rocks near low water mark, tetrasporic; Okha Port, cast ashore.

Monospora indica Boergs., sp. nov.; a *Monospora pedicellata* imprimis differt filamentis tenuioribus, monosporis sparsis, pedicellis monosporarum longioribus.



Fig. 8. *Monospora indica* Boergs. a, upper end of filaments with a monospore; b, c, d, parts of branches with monospores; e, a divided monospore; f, a monospore with two-celled pedicel. (a, f, $\times 60$; b, c, d, e, $\times 144$).

Frons erectiuscula, ramosa, dichotomo-decomposita. *Cellulae* cylindricae, in parte basali circiter 2 mm. longae et 50-80 μ latae, apicem versus gradatim breviores, in parte superiore 70-100 μ longae et 12 μ latae. *Monosporangia* pedicellata, obovato-pyriformia, 70-80 μ lata et 100-150 μ longa.

INDIA : Bombay ; Colaba, K. Gopal Iyenger (s.n.).

The plant, of which I have had material preserved in spirit, forms dense soft low tufts about 2 cm. high and as much across. Base not seen. The cells of the filaments are cylindrical near the base, very long (up to more than 2 mm.), while the breadth is only 50-80 μ ; higher up, the cells become suddenly shorter and near the upper ends are only 2-3 times as long as broad. Near the apex of the filaments the cells are again longer, their breadth here being about 12 μ and the length 70-100 μ . The apices of the filaments are blunt.

The ramification is subdichotomous (Fig. 8a). Near the base, owing to the length of the cells, it is sparse, but as the cells become shorter it becomes more frequent and in the upper part is so rich that the system of branches presents a dense fastigate appearance.

Of reproductive organs monospores only were found (Fig. 8b, c). These occur in the upper part of the thallus, but at some distance from the apex, where the cells are proportionately short. In most cases they take the place of a branch (Fig. 8a, b, c), now and then as a third branch arising together with the two normally developed branches from the upper end of the cell (Fig. 8d).

The monospores are oval to pyriform in shape, about 70-80 μ broad and 100-150 μ long. They are apparently always pedicellate. The pedicels are mostly unicellular but are occasionally two-celled (Fig. 8f) or even three-celled. The length of the pedicel is variable, usually half or as long as the monospore but sometimes longer.

In rare cases the monospore is divided into two cells by a horizontal wall (Fig. 8e). This has also been noted in *M. pedicellata* several times by Schiller*, who terms the cells "bisporos" and points out that the pedicel in this species is more or less cup-shaped. In the Indian plant this is not the case: the wall dividing the spore from the pedicel may sometimes be a little curved, but usually it is horizontal.

In describing this plant as new I should point out that the descriptions of most of the species referred to this genus (see De Toni, Syll. Alg., vol. iv. pp. 1299-1303) are so poor and defective (e.g. without data as to size of different parts of the thalli) that without access to original material they are of little value. The present species may, therefore, if compared with original material of older species, prove not to be new, but I do not think it likely.

Monospora australis (Harv.) J. Ag. (Phyc. Austral. tab. 253) differs in the sessile monospores, whilst *M. ? licmophora* (Harv.) De Toni and *M. ? Griffithsioides* (Sond.) De Toni figured by Harvey probably do not belong to this genus at all.

* Schiller, J., Über Bau, Entwicklung, Keimung und Bedeutung der Parasporen der Ceramiciaceen (Oesterreich. bot. Zeitschr., 1913).

Halophlegma Duperreyi C. Montagne in Ann. sci. nat. sér. 2, xviii. 258, t. 18 (1842). Kütz. Spec. Alg. 672; Tab. Phyc. xii. tab. 62, figs. a-c. J. Ag. Spec. Alg. ii. 111; Epicr. 90. Weber van Bosse, Algues du Siboga, iii. 315.

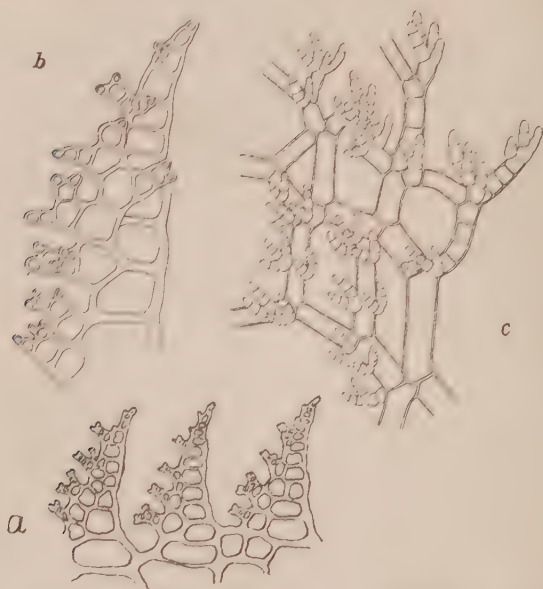


Fig. 9. *Halophlegma Duperreyi* Mont. a, margin of thallus ($\times 92$); b, free main axis of thallus ($\times 180$); c, piece of net dissected out ($\times 144$).

The figures prepared from a single drift specimen show the margin of the thallus (Fig. 9a), the free main axis more highly magnified (Fig. 9b), and a piece of net dissected out from the tissue (Fig. 9c). The peripheral short filaments forming the superficial layer are composed of from 2 to 3 cells about 12-13 μ thick, and have broadly rounded apical cells (Fig. 9c).

Of the figures of *Halophlegma* by Kützing, those of *H. africanum* Kütz. (Tab. Phyc. vol. xii. tab. 63, figs. d, e, f) show perhaps most likeness to my plant. Madame Weber has examined a small piece of this plant found in Kützing's Herbarium, and she arrived at the conclusion that it seemed to be identical with *H. Duperreyi*.

INDIA : Okha Port, a sterile specimen cast ashore.

Distr. West Indies, E. Africa, Indian Ocean, etc.

Spyridia filamentosa (Wulf.) Harvey in Hooker, Brit. Flora ii. 336 (1833); Manual Brit. Alg. 101 (1841); Phyc. Brit. tab. 46. J. Ag. Spec. Alg. ii. 340; Epicr. 268. W.G. Farlow, Mar. Alg. New England 140, tab. x. fig. 1 and tab. xii. fig. 2 (1881). Boergs. Mar. Alg. D.W.I. ii. 233, figs. 222-226. De Toni, Syll. Alg., iv. 1427 (full

synonymy given). *Fucus filamentosus* Wulfen, Cryptog. aquatica in Roemer's Archiv. f. die Botanik iii. 63 (1803).

The Bombay specimens of this variable plant have short much-curved ramuli, which, especially in specimens from the open sea, were robust, reaching a length of only about 450 μ (compare my figure, *l.c.*, fig. 223 *b*).

I also found the plant at Tuticorin (Madras); these specimens had longer ramuli which, in plants from more exposed localities, reached a length of about 650 μ , and in those from more sheltered places a length of about 800-900 μ ; these long ramuli were only about 35 μ thick (compare my figure 223 *a, b, c*).

Tetrasporangia-bearing specimens were found in January at Bombay and at the end of February at Tuticorin.

INDIA: Bombay (in various localities); Tuticorin; Hare Island.

Distr. West Indies, warmer parts of the Atlantic Ocean, Mediterranean Sea, Red Sea, Indian Ocean, etc.

Spyridia aculeata (Schimp.) Kütz. Phyc. gen. 377 (1843); Spec. Alg. 668 (1899); Tab. Phyc. xii. tab. 51, figs. *a, b*. J. Ag. Spec. Alg. ii. pars ii. 342; Epicr. 271. Harvey, Nereis Bor.-Am. part ii. 205 (1853). *Spyridia armata* Kütz. Tab. Phyc. xii. tab. 50, figs. *c, d*. *Spyridia Berkeleyana* Mont. in Exploration scientifique de l'Algérie, 141, tab. 15, fig. 6. *Ceramium aculeatum* Schimper in Unio itin., No. 966.

var. ***inermis*** Boergs. Mar. Alg. D.W.I. ii. 239, fig. 230.

The Indian specimens of this variety, which reach a length of 15 cm., agree well with the West Indian. The most characteristic feature lies in the absence of the hook-shaped spines found in the typical form. The ramuli run out into a long apical spine. They reach 1 mm. in length at their base and are about 60 μ thick and taper gradually upwards. Their component cells are about as long as broad, or a little shorter at the base; higher up they are proportionately longer, up to about $1\frac{1}{2}$ times the breadth. The thallus is terete and corticated in the older parts. The branching is more or less markedly distichous, but not always quite regular, now and then a branch being placed between the otherwise distichously arranged ramuli. (Renewed examination of my West Indian plant showed a similar case.) No tendrils were found. The Indian plant growing in exposed situations showed a more robust thallus than the West Indian one. The feathery appearance of this species distinguishes it easily from *S. filamentosa*.

The occurrence of *S. aculeata* in the Indian Ocean is of interest as its hitherto most eastern locality was the Red Sea; elsewhere it is common in the West Indies and it is also found on the shores of Spain, Morocco and the Canary Islands. According to De Toni its occurrence in the Mediterranean Sea seems to be doubtful.

Tetrasporangia were found in January.

INDIA : Dwarka, lower part of littoral zone in a very exposed locality.

Distr. West Indies, southern Atlantic shores of Europe, Morocco, Canary Islands, Red Sea.

Polysiphonia ferulacea Suhr ms. in J. Agardh Spec. Alg. ii. pars iii. 980. Boergs. Mar. Alg. D.W.I. 277, figs. 277-280. *P. breviarticulata* Harv. Nereis Bor.-Am. ii. 36, tab. 16B.

The Indian material is very like Harvey's specimen of his Australian Algae, no. 185, preserved in the Botanical Museum at Copenhagen. This number is quoted by J. Agardh (*l.c.*) with a note of exclamation. But the Indian material is much larger and more robust, reaching a height of 16-17 cm. It has the dark brown-red colour of this species and when examined with a lens the pericentral cells are very easily seen. The filaments reach a breadth of $450\ \mu$ or even more. They have four pericentral cells and the trichoblasts with a $\frac{1}{4}$ divergence are well developed. The branches arise in the same position as the trichoblasts. No cortical layer is present.

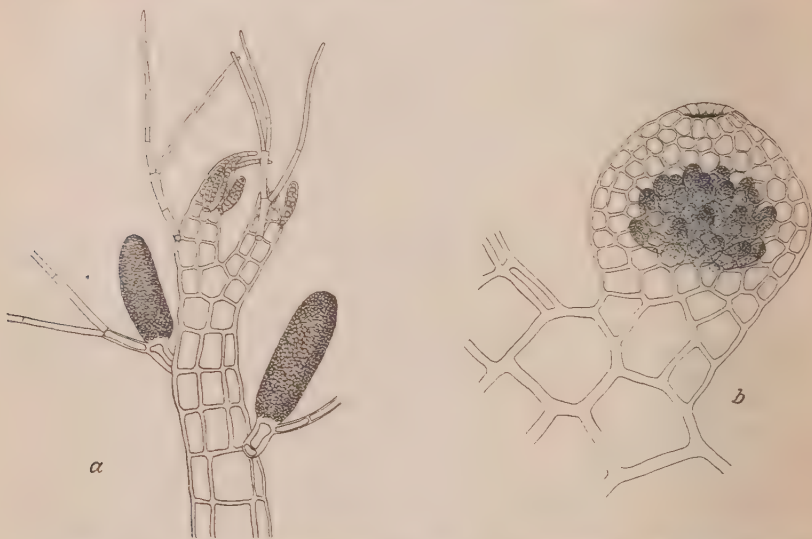


Fig. 10. *Polysiphonia ferulacea* J. Ag. a, apical end of filament with androphores; b, cystocarp (a, $\times 180$; b, $\times 140$).

All except a few small specimens were sterile. The tetrasporangia are formed in the end of the spirally arranged filaments, one in each segment. The antheridial stands (Fig. 10a) resemble my fig. 279 (*l.c.*) excepting that the sterile cells found at the apical end of the West Indian plant are lacking. The cystocarps (Fig. 10b) however, agree precisely. They are nearly spherical, up to about $400\ \mu$ long and $365\ \mu$ broad. Fertile plants were found in January.

Two specimens in the collection of algae from Karachi belonging to the Kew Herbarium are referable to this species. They were determined as "*Polysiphonia* near *P. utricularis* Zan." which, as stated by J. Agardh (Spec. Alg. ii. pars iii. 966), is referable to *P. ferulacea*.

INDIA: Dwarka, near low water on rocky exposed shores, dredged in 5 fathoms, also epiphytic upon *Codium*; Karachi, *J. A. Murray* (Herb. Kew.).

Roschera glomerulata (C. Ag.) Weber van Bosse Listes des Algues du Siboga, iii. Rhodophyceae 2, Ceramiales, 358. *Hutchinsia glomerulata* C. Ag. Spec. Alg. ii. 102. *Tolypocladia glomerulata* Schmitz. in Engler, Bot. Jahrb. xxi. 160 (1895); •Falkenberg, Rhodomelaceen, p. 177.

This species has 4 pericentral cells and bears branches with $\frac{1}{4}$ phyllotaxis. Most of these branches have definite growth but occasionally a branch develops indefinitely which provides for increased ramification. The branches which remain short have a smooth basal part, but produce short thornlike branchlets above. From some of the segments in these thornlike branchlets trichoblasts arise. These are, as mentioned by Falkenberg, monosiphonous, unbranched filaments, the cells of which are at first short and coloured (Fig. 11a, b); but gradually the uppermost ones lengthen

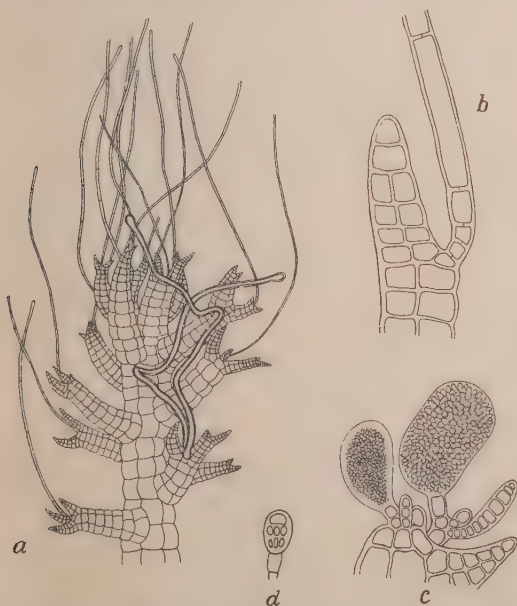


Fig. 11. *Roschera glomerulata* (Ag.) Weber van Bosse. a, apex of a filament with trichoblasts and two rhizoids; b, end of a thornlike branchlet with the basal part of a trichoblast; c, end of a branchlet with androphores; d, a young androphore. (a, about $\times 32$; b, c, d, $\times 265$).

out, become colourless and die away. The lower cells go through the same process.

In the trichoblasts destined to become androphores the two lowermost cells remain undivided (Fig. 11c). The upper one of these elongates, forming, together with the small one below, the stalk of the antheridial stand. The other cells above become polysiphonous (Fig. 11d) and, after several divisions, form together a somewhat oblique oblong body (Fig. 11c) about $115\ \mu$ long and $80\ \mu$ broad. Seen from above the antheridial stand is circular in outline. Antheridia were found at the end of February at Tuticorin.

INDIA: Dwarka, exposed coasts; Okha Port, cast ashore; Tuticorin, on a tuft of *Rosenvingea intricata* in shallow water.

Distr. Widespread in the Indian and Pacific Oceans.

Heterosiphonia Muelleri (Sond.) De Toni Syll. Alg. iv. 1238. *Dasya Muelleri* Sond. in Harvey, Phyc. Austral. i. tab. xxxi (*partim*). J. Ag. Spec. Alg. ii. pars iii. 1196; Till Algenes Systematik xi. 84. *Dasya plumigera* Harv., Alg. Austral. exsicc. No. 208 (*partim*).

The plant (Plate II. fig. 2) has a rather thick, cartilaginous, creeping, rhizome-like, perennial base composed of a parenchymatic tissue in which as a rule the central and pericentral cells are visible. From the surface of the rhizome short spinelike branchlets protrude (Fig. 12c); these are composed of a single row of cells, which are larger below and become gradually smaller upwards. From this basal part the erect feathery stems arise. These are definitely annual and are found during the calm season of the year between the monsoons. The stems receive from each sympodium, of which the plant is built up, two segments, rarely more. The segments in the main stem are composed of 10 pericentral cells. In the younger thallus especially the segments are broader in the middle than at the ends, and the peripheral walls of the cells are very convex. No cortical layer is present. The free ends of each branch-system (Fig. 12a) are found alternating in two rows on both sides of the main stem. The pinnules of last order (Fig. 12b) are formed in the same way, only on a reduced scale. They bear at the ends 2 or 3 short spinelike branchlets, the most vigorous of which are provided with a short spine at the upper end. The number of pericentral cells is reduced in the upper part of the branchlets and the upper spinelike ends are monosiphonous (Fig. 12b). From about the middle of these branchlets (Fig. 12a, b) repeatedly forked trichoblasts are given off. When young the cells in these are barrelshaped, about as long as broad, but when older they are cylindrical, about $30\text{--}50\ \mu$ broad and $100\ \mu$ long. No fertile organs were present; only once in a trichoblast have I seen two polysiphonous segments (Fig. 12b).

I have compared some Australian specimens in the herbarium of the Botanical Museum, Copenhagen, with the Indian plant. One of these was gathered at Port Phillip by F. v. Mueller and referred to *Dasya Muelleri* by J. Agardh. Two other specimens belong to Harvey's Australian Algae, no. 208, which Harvey named *Dasya*

plumigera. This number J. Agardh (Spec. Alg. ii. pars 3) partly refers to *Dasya struthiopenna* (p. 1193) and partly to *Dasya Muelleri* (p. 1196). According to J. Agardh (cfr. Till Algernes Systematik xi. 84) the difference between these two species consists in the cystocarps, which are ovate and borne laterally in *D. Muelleri*, and

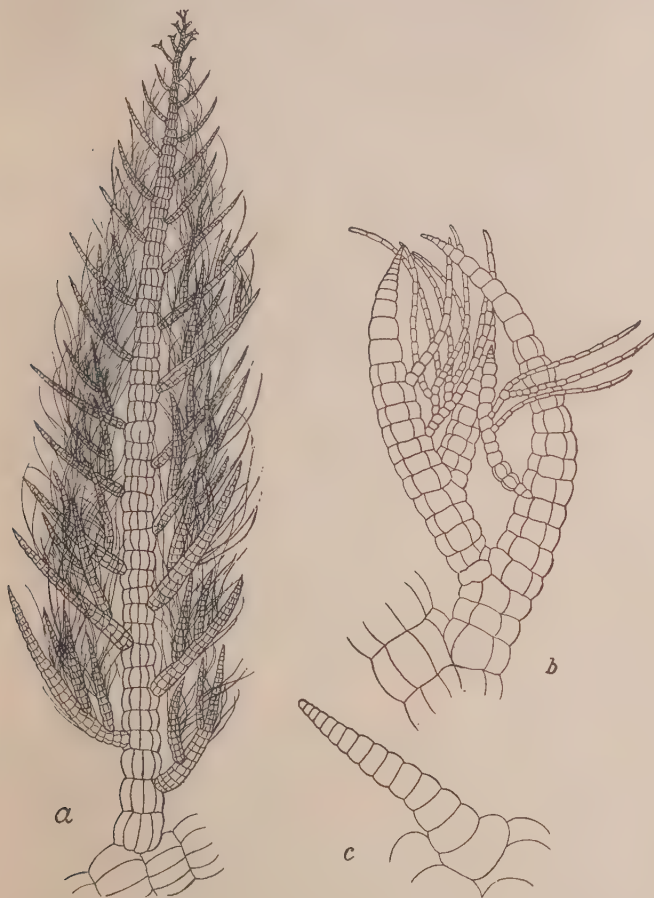


Fig. 12. *Heterosiphonia Muelleri* (Sond.) De Toni. a, free end of sympodium of first order; b, free end of sympodium of second order; c, spinelike branchlet upon the rhizome. (a, $\times 24$; b, c, $\times 60$).

are globular, about double the size and terminal in *D. struthiopenna*. The two species are, according to him, figured by Harvey on pl. 31 of *Phycologia Australica*. Fig. 1 of his plate gives a representation of *D. Muelleri*, whilst Fig. 2 is referable to *D. struthiopenna*. My material is unfortunately sterile but it agrees very well with Harvey's Fig. 1, and I have referred it to *H. Muelleri*.

Though the Indian specimens correspond fairly well with the Australian, they differ in some respects. Thus there are 10 pericentral cells in the main stem, whereas according to J. Agardh the Australian plant has only 5-7. Moreover, in the latter the erect stems seem to be corticated rather high up, while in the Indian specimens they are bare. It is possible that the Indian plant is distinct from the Australian, but as my material is sterile, I do not think it advisable to describe it as new.

INDIA : Dwarka, on low-lying rock pools on very exposed coast ; Okha Port, east ashore:

Distr. Australia.

DELESSERIACEAE.

Cottoniella fusiformis Boergs. Mar. Alg. Canary Isl., Rhodophyceae iii. 144, figs. 58-59.

On looking through the collection of algae from Karachi on loan from the Kew Herbarium I found some specimens of a finely divided, delicate and rose-coloured *Floridea* which I at first believed to be *Sarcomenia miniata*, a species I had already found at Dwarka. A microscopical examination, however, showed that I had to deal with a species of *Cottoniella*. As this genus was known only from the Atlantic its presence in the Indian Ocean was of much interest. The Indian plant has exactly the characteristic structure of this genus, viz., the curved apical summit of the polysiphonous filaments, from which issue the long, monosiphonous, unilaterally placed branchlets. So far as I can see from dried material, which is not easy to work with, the monosiphonous filaments are given off in pairs side by side. The branchlets seem generally to be placed upon the concave side of the branches, this being often, but not always, the ventral surface. The plant is much and irregularly branched, the main filaments are at least 250 μ broad, and are covered by a cortical layer.

This structure suggests that we most probably have to do with the Canary species, *Cottoniella fusiformis* Boergs., but even though the species is not determined with absolute certainty the occurrence of the genus in the Indian Ocean based on these old Kew specimens is worthy of record.

INDIA : Karachi, Dec. 1859, W. J. S. Pullen (Herb. Kew.).

Sarcomenia miniata (Ag.) J. Agardh Spec. Alg. ii. pars 3, 1260 ; Anal. algol., Cont. iii. 133. Weber van Bosse, Notes on *Sarcomenia miniata* Ag., in Journ. of Bot. xxxiv. 281, plate 359 (1896). *Hutchinsia miniata* Ag., Spec. Alg. ii. 94.

I have not seen any original material of this species, but the Indian plant seems to agree well with the original description and with Madame Weber's description and figures.

The structure of the thallus of *Sarcomenia miniata* is almost the same as that of *Cottoniella* except that the monosiphonous filaments characteristic of that genus are missing. When fully

developed it is composed of a central cell and four pericentral cells, the two first formed being the largest as seen in a transverse section (Fig. 13*d*). From the upper and lower corners of these cells two smaller cells are cut off forming the two peripheral cells at both sides of the thallus; these cells have only half the length of the other 5 cells in each segment (Fig. 13*c*). The thicker filaments in the Indian plant have a diameter of about 160 μ and the length of the segments is about 200 μ . The upper ends of the filaments are only about 10 μ thick.

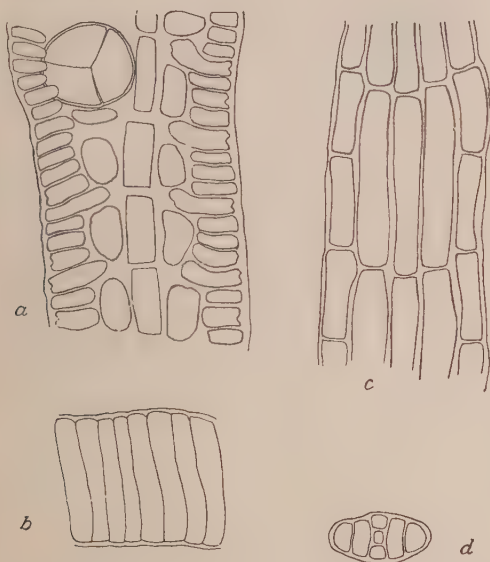


Fig. 13. *Sarcomenia miniata* J. Ag. a, part of a stichidium seen from above; b, part of the same seen from the edge; c, surface view of (sterile) thallus; d, transverse section of thallus. (a and b, $\times 250$; c, $\times 180$; d, $\times 140$).

Tetrasporic plants only were found. The stichidia form ribbonlike bodies which continue to grow at their upper ends long after the sporangia in the lower part are mature and have escaped. The upper end of the stichidium often elongates like a vegetative branch and is even forked. The development of the stichidia is described and figured by Madame Weber. The two big pericentral cells are divided by a vertical wall into two cells. One of these does not divide further, the other is divided by a transverse wall into two cells, the uppermost of these becoming the mother cell of the tetrasporangia, and the lowermost the foot-cell (compare fig. 13*a*). At the same time the peripheral cells on both sides of the sporangia are divided by transverse walls into two cells. When the sporangia are mature and have escaped, the peripheral cells

lengthen and (together with the non-fertile cells first formed by the vertical division of the two pericentral cells) cover the hole through which the tetraspores have escaped (Fig. 13a). According to Madame Weber, cells are cut off from the ends of the large marginal cells, but I have not observed this. The healing of the sporangia is very useful to the plant, since the stichidia in this way are preserved and able to partake in assimilating activity. The ripe sporangia are about 120 μ broad and often more than 2 mm. long.

INDIA : Okha Port, cast ashore.

Distr. Cadiz, South Africa.

Myriogramme okhaënsis Boergs., sp. nov. ; a speciebus relatis praecipue differt thallo *Acrosorio* (*Nitophyllo*) *uncinato* persimili.

Frons estipitata, enervosa, circiter 7 cm. alta, irregulariter multilobata et sinuata, superne monostomatica, dein bistomatica, lobis 2–5 mm. latis composita.

INDIA : coast of Okhamandal, Okha Port, cast ashore, *Boergesen* 5485 (type). Karachi, June 1883, *J. A. Murray* (Herb. Kew.).

The thallus (Plate II. fig. 3) reaches a height of about 7 cm. It is flat, sinuate, deeply and very irregularly divided into numerous lobes which, by means of the marginal rhizoids, become fastened not only to the rocky substratum but often to other parts of the thallus, the plant in this way forming irregular clumps and tufts. The breadth of the thallus varies from 2 to 5 mm. Its margin is irregularly sinuate and provided with numerous small teeth (Fig. 14a).



Fig. 14. *Myriogramme okhaënsis* Boergs. a, part of thallus with groups of tetrasporangia; b, marginal tooth; c, transverse section of the thallus. (a, $\times 2$; b, $\times 205$; c, $\times 60$).

Nerves and microscopic veins are absent. The thallus consists of two layers of cells (Fig. 14c), except near the edge, where it is composed of one layer only. In the small teeth along the margin a transversely divided apical cell is present (Fig. 14b). The surface

cells are polygonal and about 60–80 μ broad. In a few of the specimens small groups of tetrasporangia were present ; these occur scattered in the thallus (Fig. 14a) and are about 60 μ broad.

M. okhaënsis comes near to the group of species, mentioned by Kylin in his very valuable treatise " Studien über die Delesseriaceen " [Lunds Universitets Årsskrift, N.F. Avd. 2, Bd. xx. Nr. 6, 60 (1924)], characterized by the presence of a transversely divided apical cell in the teeth ; but the shape of the thallus is different. By the irregularly bent and toothed lobes its habit reminds one of *Acrosorium* (*Nitophyllum*) *uncinatum* (J. Ag.) Kylin, but the latter plant is easily distinguishable by the presence of microscopic veins. In the Kew Herbarium there is a large somewhat bleached specimen of *M. okhaënsis* collected by Murray and determined as *Nitophyllum punctatum* J. Ag.

Myriogramme bombayensis Boergs., sp. nov. ; a speciebus nervosis thallo aliter formato distincta.

Frons brevistipitata, circiter 3 cm. alta, irregulariter sinuoso-lobata, e margine prolifera, superne monostromatica dein bistromatica, nervosa, nervis robustis interdum furcatis instructa. (Plate II. fig. 4).

INDIA : Bombay ; Malabar Hill, on rocks facing open sea, Boergesen 5132 (type). /

The base consists of irregularly lobed discs formed by groups of rhizoids fusing together. From this base, very short nearly terete stems arise, often with remains of the leaf-like thallus attached, and continue as vigorous nerves throughout the leaf-like thallus. This is of a dark-red colour, leaf-like, wavy, irregularly lacinulate and proliferous along the margins, from which also numerous rhizoids often grow out. The thallus (Plate II. fig. 4), the lobes of which are often attached to each other by means of the rhizoids, is about 3 cm. high, forming dense tufts. The breadth of the thallus varies from 1 mm. to about 1 cm.

A transverse section shows that the thallus consists, in the younger parts, of a single layer of cells (Fig. 15b), but in the older parts of two layers. The nerves seen in transverse section are broadly oval or elliptic and consist of large cells in the middle and smaller ones externally (Fig. 15b). The nerves are occasionally forked.

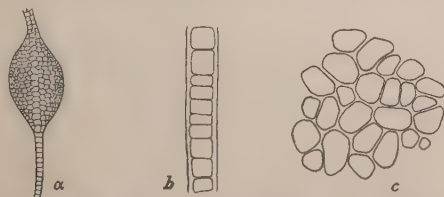


Fig. 15. *Myriogramme bombayensis* Boergs. a, transverse section of the thallus with nerve ; b, the same without nerve ; c, cells of thallus seen from above. (a, $\times 22$; b, $\times 205$; c, $\times 265$).

When seen from above the cells of the leafy thallus are small, roundish or of more irregular shape with thick walls (Fig. 15c) ; their diameter is about 16 μ .

This species belongs to a group of species of *Myriogramme* characterized by Kylin (*l.c.* p. 60) by the presence of vigorous nerves. As the nerves are often dichotomously divided it comes near also to the genus *Schizoseris*, but, to judge from the species referred by Kylin (*l.c.* p. 67) to this genus, these are all larger forms with the thallus divided into many leaf-like parts and all formerly referred to the genus *Delesseria*.

I am much indebted to Professor Kylin, who has most kindly confirmed my reference of this and the previous species to *Myriogramme*.

II.—THE BUTTRESSES OF RAIN-FOREST TREES.

W. D. FRANCIS.

The flattened extensions of the roots and stems of certain species of trees are now commonly referred to by English botanists as buttresses or plank-buttresses. The accompanying illustration (Plate III) shows examples of buttressed stems in a littoral forest.

Buttresses are a feature of many species of rain-forest trees as well as of several kinds of trees which inhabit mangrove and littoral forests. The phenomenon of buttress development is seen at its highest in tropical and subtropical rain forest. It appears to be comparatively rare in temperate forests. In explanation of the genesis of buttresses in rain-forest trees it has been fairly generally assumed that they have arisen as mechanical supports to the stem. H. N. Whitford* especially has stressed this view. He states " This means that the tree in youth while it is crowded in the forest produces a regular bole, but that when it reaches above the surrounding vegetation, in response to the increased heaviness of the top, the buttresses appear at the base, enabling the tree to withstand the extra strain."

One of the most recent and novel contributions to the mechanical theory has been put forward by Navez.† Briefly stated, Navez's conclusions are to the effect that tabular roots (a term evidently equivalent to buttresses) are located principally on the sides of the dominant winds and that these roots (or buttresses) act as resistant cables and not as buttresses.

In my own investigations on buttressed trees in Australian rain forests‡, the buttresses were found to be well developed when the trees were comparatively young, and long before they produced heavy crowns or became exposed to the force of winds. This observation appertains to several species of trees. It raises a very serious

* Philippine Journ. Science, i, 420 (1906).

† Proc. Nat. Acad. Sciences U.S.A., xvi, 343 (1930).

‡ Proc. Roy. Soc. Queensland, xxxvi, 21 (1925); Australian Rain-Forest Trees, 8 (1929).

PLATE III



Herierva littoralis in littoral forest near high-tide mark. Yarrabah, near Cairns, North Queensland. Photo J. E. Young.

objection to the supposition that winds and heavy crowns exert a direct action in the incipient production of buttresses. Everyone who is familiar with the conditions in dense rain forests will recognise that the effects of winds on young trees much below the forest canopy is negligible.

It was also noticed that the axis or main stem of large buttressed trees was much smaller at the point of contact with the soil than above the buttresses. From this and from other observations it is concluded that the roots contribute chiefly to the construction of the buttresses in the earlier stages and that the stem performs a large part in their development in the later stages of the life of large buttressed trees. These deductions indicate that the buttresses of large trees are the combined extensions of the roots and stem. The observed attenuation of the main axis of large buttressed trees towards the base shows that the buttresses of these trees do not conform exactly to the buttresses which support the walls of buildings. Presumably the walls of buildings, which are supported by buttresses, are rarely thinner at the base than above.

Petch* has recently published a paper on the subject. The views expressed by him are similar to my own in so far as he discredits the theory which attributes buttresses to the direct effects of strains and tensions induced by winds and heavy crowns. In explaining the origin of buttresses Petch associates them with a deficient tap root and suggests that their formation is due to the restriction of the nutritive current to narrow regions of the stem continuous with the lateral roots.

The origin of buttresses appears to be somewhat obscure. There are, however, certain considerations which indicate that the physical and chemical properties of the soil may be associated with their genesis. The prevalence of strongly buttressed trees among mangroves as well as in rain forests is suggestive. It leads one to suspect that the definite tendencies of roots to project into the air and become perpendicularly flattened in both of these classes of forest are repulsions from some conditions in the soils.

The buttressed Australian species of rain-forest trees have already been enumerated†. Among the prominently buttressed mangroves of the Malayan region the following are examples: *Bruguiera eriopetala*, *B. caryophylloides*, *B. parviflora*, *B. gymnorhiza*, *Xylocarpus moluccensis*, *X. granatum*, *Heritiera littoralis* and *Ceriops Candolleana*. Several of these species are figured by J. G. Watson‡, and in the excellent photographs the buttresses are well shown.

Although it may not be of any significance, it is of interest to remark that some of these buttressed mangroves are allied to rain-forest species which are also characterized by the possession of buttresses. *Heritiera littoralis* is related to *Tarrietia* (Sterculiaceae),

* Annals Royal Botanic Gardens, Peradeniya, xi. 277 (1930).

† Proc. Roy. Soc. Queensland xxxvi. 21 (1925); Australian Rain-Forest Trees, 8 (1929).

‡ Mangrove Forests of the Malay Peninsula, Malayan Forest Records No. 6 (1928).

and *Xylocarpus moluccensis* and *X. granatum* are allied to *Dysoxylum* and *Cedrela* (Meliaceae).

The conditions prevailing in dense rain forests of a tropical character produce soils which are peculiar in some respects. One very important feature of the soils in Australian rain forests is the superficial layer of decomposing vegetable material. This consists of the accumulation of detached leaves, twigs, branches and bark. It results from the normal shedding processes of living plants and from the disintegration of dead and dying ones. The composition and extent of this decaying plant material in rain forests is affected by the denseness of the vegetation and the exclusion of winds with their dispersing and drying effects. The humidity of the air prevents bush fires, thus ensuring that the decomposing material is not subjected to rapid combustion. The humid atmosphere also accelerates the processes of decay, which are not retarded by the drying and antiseptic effects of the winds and strong sunlight which are active in open forests.

One of the conditions which may be connected with buttresses is that of aeration. The penetration of air into the soil of rain forests is strongly impeded by the layer of decaying vegetable material. In addition some of the organic compounds derived from the decomposition absorb oxygen from water. In this way the oxygenation of the soil below is further retarded.

The amount of moisture in the soil is also a factor which may be associated more or less directly with buttressed trees in rain forests. Trees with the largest buttresses are most frequently seen on damp flats or on slopes which bear indications of moist or water-saturated soils.

The considerable amounts of decomposing vegetable material which I have always noticed in Australian rain forests have not been observed in all rain forests. T. F. Chipp* has remarked upon the general absence from the soil surface of vegetable *débris* in the Gold Coast forests of tropical Africa. He attributes this condition to the rapid action of ants and the microscopic flora and fauna in destroying the *débris*.

In another place† he demonstrates the utility of buttresses in identifying trees in the forest. He appropriately comments upon the scant attention which is given to this peculiar structural feature in descriptive botanical works.

III.—CONTRIBUTIONS TO THE FLORA OF BURMA: IX.‡ C. E. C. FISCHER.

Tristellateia australasica A. Rich. [Malpighiaceae].

Known previously from Indo-China, Malay Peninsula, Formosa to Australia.

* Oxford Forestry Memoirs, No. 7, 41 (1927).

† *Kew Bulletin*, 1922, 265.

‡ Continued from *K.B.* 1929, p. 317.

Mergui, Maliwun, flowers Jan., *R. N. Parker* 3164. "Edge of tidal swamp."

Microtropis filiformis King [Celastraceae].

Known from Siam and the Malay Peninsula.

Mergui, Victoria Point, flowers Jan., *R. N. Parker* 3154. "Shrub, flowers yellowish-green."

Connarus oligophylla Wall. [Connaraceae].

Known from Penang.

Mergui, Victoria Point, 200 ft., Jan., *Su Koe* per *C. E. Parkinson* 7609. "Tree; flowers whitish-pink. Fruit green, glabrous. Stem brownish." Malayan name: *Kahyn Sadin*.

Acacia Meeboldii Craib [Mimosaceae].

Also in Siam.

Tenasserim, Borvachaung, fruit April, *Meebold* 15295; Kalin kwan chaung, 200 ft., fruit Feb., *C. E. Parkinson* 1693. "A thorny climber."

Polyosma integrifolia Bl. [Saxifragaceae].

From Assam and the Malay Peninsula.

Mergui, Myinmolekat, 6500 ft., fruit Jan., *R. N. Parker* 3177. "Small tree."

Ophiorrhiza erubescens Wall. [Rubiaceae].

Tenasserim, Chappedong Hills, buds Feb., *Wallich* No. 6233 (type in Kew Herb.); Tavoy, Zimba Valley, "in dense evergreen forest," fruit Nov., *R. N. Parker* 2263.

This species has been represented hitherto by a single sheet in the Wallich Herbarium and was considered by Sir J. D. Hooker in the Flora of British India as a doubtful species (iii. 84). The sheet contains 2 plants with a very few buds. The following description has been compiled from the Wallich sheet and Mr. Parker's specimen.

A herb or undershrub about 30 cm. high. Stem simple or branched, crisped pubescent upwards. Leaves lanceolate, obtusely acuminate, narrowed into the petiole, 6–13 cm. long, 1.75–3 cm. wide, dark and glabrous above, below pale and crisped puberulous especially on the midrib and nerves, midrib and 8–11 pairs of primary nerves distinct above and slightly raised below; petioles 0.5–3.5 cm. long, crisped puberulous. Stipules ovate, caudate, up to 0.75 cm. long. Cymes terminal; peduncles (and pedicels) crisped rufous-pubescent, 1.7 cm. long (in fruit); pedicel 0.25–0.4 cm. long. Buds puberulous. Calyx-tube very short, lobes short. Corolla prismatic, 5-angled, lobes valvate, ligulate, acute, keeled, mealy-puberulous within, much longer than the tube; tube glabrous within, villous at the mouth. Anthers nearly sessile, linear, nearly as long as the corolla-lobes. Disk fleshy, 2-lobed, brown-puberulous. Flowers not seen. Capsule reniform, hardly compressed, very narrowly winged at the outer angles, 1 cm. wide, 0.5 cm. long, reddish-brown, minutely sparsely puberulous. Seeds minute, angled.

The species comes very near *O. trichocarpa* Bl. but differs in the shape and pubescence of the leaves, shape of stipules and the nearly glabrous capsules.

Randia Klossi Ridl. [Rubiaceae].

Hitherto known only from Siam.

S. Tenasserim, Kyeinchaung, 100 ft., Feb., C. E. Parkinson 1660.
"A climber. Flowers white turning yellow."

Psychotria rhinocerotis Bl. [Rubiaceae].

In K.B. 1927, p. 209, this was wrongly described as *Gaertnera lasianthoides* Fischer, which name now goes into synonymy.

Lasianthus glaberrimus Ridl. 1918, non 1920 [Rubiaceae].

Known only from the Malay Peninsula.

Mergui, Sandawut, flowers March, R. N. Parker 2773. "Shrub 4 ft. high. Leaves very foetid when bruised." Vern. *Myauk-i*.

Vallaris anceps (Wall.) Fischer, comb. nov. [Apocynaceae].

This species was described in K.B. 1927, p. 92, under the name *Vallaris arborea* Fischer. It is, however, identical with *Trachelospermum anceps* Dunn & R. Williams in K.B. 1920, p. 343, which was founded in part on *Vallaris? anceps* ms. in Wall. Cat. 1622. The plant, however, is not a *Trachelospermum* but a *Vallaris* in virtue of the following characters.

Leaves punctate. *Corolla* tube not swollen over the anthers and not constricted at the mouth. *Anthers* with a large gland on the connective. *Seeds* with a long beak (Dunn and R. Williams did not see seeds).

The combination *Trachelospermum anceps* and the trivial name *arborea* must, therefore, be sunk in synonymy in favour of the combination *Vallaris anceps* (Wall.) Fischer.

Ficus lepicarpa Bl. [Moraceae].

Recorded from the Malay Peninsula.

Mergui, Palauk chaung, 1600 ft., Jan., R. N. Parker 3095.
"Large shrub on rocks in stream bed."

Asarum cordifolium Fischer [Aristolochiaceae].

Described from specimens from Assam.

Mali—Nam Tamai Divide, 3000-4000 ft., fruit April, Kingdon Ward 6661. "On shaded earth banks where the soil is moist."

Musa nagensium Prain [Musaceae].

From the Naga Hills of Assam.

Myitkyina District, Tagwin chaung, 400 ft., flowers and fruit Nov., C. E. Parkinson 1759. "In evergreen forest." Kachin name: *Lek Chep*.

Musa paradisiaca Linn., var. **pruinosa** King [Musaceae].

From Assam.

Myitkyina District, Tagwin chaung, 400 ft., flowers and fruit Nov., C. E. Parkinson 1760. "In evergreen forest." Fruit eaten by Kachins. Kachin name: *Nga Toe*.

Musa velutina Wendl. & Drude. [Musaceae].

From Assam.

Myitkyina District, Tagwin chaung, 400 ft., flowers Nov., *C. E. Parkinson* 1765, "Attains the height of a man. Found near water."
Burmese name: *Hnet Pyaw A.*

Gahnia javanica Moritzi [Cyperaceae].

Reported from Yunnan, the Malay Peninsula and the Malay Islands.

Mergui, Myinmolekat, 6800 ft., flowers Jan., *R. N. Parker* 3123.
"Stems 3-4½ ft. high."

Carex finitima Boott [Cyperaceae].

From Eastern Himalayas and from China.

Myitkyina District, Hpimaw Pass, above 11,000 ft., June, *Su Koe* per *C. E. Parkinson* 10081.

Carex fragilis Boott [Cyperaceae].

From Sikkim.

Myitkyina District, below Chimali Pass, 10,100 ft., May, *Su Koe* per *C. E. Parkinson* 9915.

Carex setigera Don [Cyperaceae].

From the Himalayas from Kashmir to Nepal.

Myitkyina District, below Chimali Pass, 10,000 ft., May, *Su Koe* per *C. E. Parkinson* 9911.

IV. NOTES ON NEW OR RARE HYPERICA.

B. STEFANOFF.

During a recent study of the taxonomy and phytogeography of the Mediterranean Oriental *Hyperica* I have had the opportunity of examining many sheets from the Herbarium of the Royal Botanic Gardens, Kew. My best thanks are due to the Director for the loan of the material and to Dr. W. B. Turrill for assistance in preparing for press the manuscript of these notes on new or rare *Hyperica* preserved in the Kew Herbarium.

Hypericum inodorum Willd. (*H. ramosissimum* Led.). Three sheets from the Caucasus and Armenia indicate that this species consists of two easily distinguished varieties. The first, var. **glandulosum** Stefanoff, agrees with the original description of Boissier (Flor. Or. i. 789) and is probably the commoner of the two varieties here recognized. It is represented, in the material seen by me, by two sheets: Armenia (leg. Szovits); Caucasus (leg. Ledebour). It may be defined as follows: sepala aequalia, lanceolata, apice acuta, margine glandulis remotis breviter stipitatis obsita. The second variety is named var. **integrisepalum** Stefanoff and is represented by a single sheet of material collected in Lazistan (*Balansa*, Plantes d'Orient, 1866, no. 1377). It is characterized as follows: sepala inaequalia, spathulato-linearia, apice rotundata vel subacuta,

margine integra. Apart from the form of the sepals and the presence or absence of glands on their margins, these two varieties have the same characters. *H. inodorum* Willd., as cultivated in gardens, appears to be more frequently represented by the second variety, var. *integrisepalum*.

***Hypericum heterophyllum* Vent.** Jard. Cels. tab. 68; Boiss. Flor. Or. i. 793. A specimen collected in Asia Minor near Smyrna, comm. E. Whittall, no. 816, in Herb. Kew., is referred to this. *H. heterophyllum* Vent. is one of the rarest species of the Mediterranean-Oriental group of the genus. Boissier, after giving a diagnosis of the species, writes: "vidi in Herb. DC. specimen incompletum hujus plantae a recentioribus non lectae." Ventenat quotes only Persia (leg. Olivier & Brug.) and Whittall's specimen is only the second one known, but is much the more complete. The distance between Persia and Smyrna makes one suspect that one or the other locality may be incorrectly given. *H. heterophyllum* Vent. may be considered the type of the subsection *Triadenioidea* Jaub. et Spach, but differs radically in many of its morphological characters from all the species subsequently included by various authors in the same subsection. As Boissier remarks, in its general appearance the plant recalls *H. linearifolium* Vahl. It differs, however, taxonomically in many respects from all known species of *Hypericum* of the Mediterranean-Oriental group, and its isolation in a separate section appears to be reasonable.

***Hypericum ovalifolium* Stefanoff** sp. nov.; ab *H. fragili* Boiss. et Hausskn. et *H. pumilio* Bornm. foliis floribusque majoribus, seminibus cylindricis vix rugosis atribus differt.

Planta perennis, basi suffruticosa, ramis simplicibus abbreviatis 6–8 cm. altis adscendentibus glabris praedita. *Folia* subcarnosula, pallide viridia, plus minusve glauca, ovato-rotundata vel fere orbicularia, ad 1 cm. longa et 8 cm. lata, basi abrupte in petiolum attenuata, apice sparse pellucide punctata, margine plana vel vix revoluta et remote glanduloso-punctata. *Cyma* terminalis, distincte pedunculata, pauciflora. *Sepala* lanceolato-elliptica, dorso epunctata, margine glandulis nigris breviter stipitatis obsita. *Corolla* calyce 2–2.5-plo longior, petalis oblongis apice glandulis paucis breviter stipitatis obsita. *Stamina* basi in fasciculos tres coalita. *Ovarium* triloculare; styli tres. *Capsula* usque ad basin valvis tribus dehiscens, dorso longitudinaliter resinoso-striata. *Semina* cylindrica, leviter curvata, obsolete rugulosa et latere interiori subcarinata.

SYRIA BOREALIS: Amanus, in monte Duldul, 1500–2000 m., M. Haradjian 3897, in Herb. Kew.

The species described above is properly classified with the species of the subsection *Triadenioidea* Jaub. et Spach, as enlarged by Boissier and R. Keller. It is easily distinguished from *H. nummularium* L. and *H. nummularioides* Trautv., and is best compared with *H.*

fragile Boiss. et Hausskn. and *H. pumilio* Bornm. (a species wrongly classified by R. Keller in the subsection *Arthrophyllum* Jaub. et Spach). It differs in its larger leaves and their shape and its larger flowers. The shape and sculpturing of its seeds give characters which I have found of great importance in the genus. The seeds of *H. fragile* and *H. pumilio* are identical, very elongated, noticeably curved, of a pale colour and with an almost smooth surface. In *H. ovalifolium* the seeds are dark-coloured, only slightly rugose, and have a marked cylindric shape. They are only slightly curved and on the inner side are distinctly carinate with one small appendage at the base. A new grouping of the species of *Hypericum* is to be proposed in a subsequent work, but under the old system our species is to be placed in the subsection *Triadenioidea*.

***Hypericum olympicum* L.** The numerous specimens of this species from the Balkan Peninsula and Asia Minor, which I have had the opportunity of examining, indicate that this species, which is one of the most characteristic types of the genus in the Mediterranean region, is very polymorphic and consists of a number of varieties distinguishable by important and constant characters.

The typical variety has a very wide geographical distribution and appears to cover the whole range of the species (S. E. Balkan Peninsula, Asia Minor, Armenia, and Syria). With *H. polyphyllum* Boiss. et Bal. and *H. Hayekii* Siehe it forms a natural group (the subsection *Olympia*), formerly accepted as a separate genus. The last two species occupy comparatively small geographical areas and have constant morphological characters, while *H. olympicum* contrasts with them in having a strongly developed tendency for variation in the general size and aspect of the plant, the form and size of the leaves and sepals, and in other characters.

In the Balkan Peninsula in addition to the forma *minus* (*H. olympicum minus* Ch. et Bory) and the var. *coronense* Vel., we have *H. Dimonieii* Vel., which Bornmüller has recently [in Bot. Jahrb. lix. 432 (1925)] reduced to a variety of *H. olympicum* and which is probably merely a modification developed under habitat conditions in the subalpine zone of the mountains of Central Macedonia. In the mountains of the eastern parts of the Balkan Peninsula, especially in the southern Rodopes, Ali Botush, and Belasitza, as also in Greece and Asia Minor, *H. olympicum* is a common plant in the mountain zones, ascending to over 1000 m. and even to 2000 m.

One variety (or modification) common at high altitudes is named var. *viride* *Stefanoff* with the characters: planta valde caespitosa, caulibus abbreviatis usque ad 25 cm. Its leaves are shorter but much broader than in typical *H. olympicum* L. and are a brighter green, without the bluish-green colour caused by the fine bloom covering the leaves of the typical plant, and with many pellucid dots which are few or absent in the plants from the lowlands or lower mountain zones. The sepals, as in the commoner type variety, vary much in size and shape, and specimens of var. *viride* from

different localities can be more or less distinguished by sepal characters. The simple stems, usually with solitary flowers, form a constant character.

Another variety, morphologically very similar to var. *viride*, is named var. **latifolium** *Stefanoff*, with the diagnosis: a var. *viridi* caulibus longioribus, foliis latioribus et longioribus, glandulis pellucidis numerosioribus, marginibus glandulis nigris dense instructis, cymis floribus tribus vel multis praeditis differt. N. SYRIA: Amanus, *M. Haradjian* 393, in Herb. Kew.

A third variety is named var. **prostratum** *Stefanoff*, with the diagnosis: caulibus prostratis. N. SYRIA: Amanus, *M. Haradjian* 2501, in Herb. Kew. This variety is often cultivated in gardens under the wrong name of *H. polyphyllum* Boiss. et Bal.; it differs from other varieties of *H. olympicum* chiefly by its prostrate stems. The leaves have a bluish-green colour and, as in the var. *latifolium*, have many pellucid dots and a limited number of black points confined mainly to the top of the lamina. The cymes are composed of three or more flowers, and the sepals, as in the var. *latifolium*, have a number of black points which are absent in the typical variety and in var. *viride*.

The above varieties from the Balkan Peninsula and Syria resemble typical *H. olympicum* so closely that they ought not to be confused with the other two species of the section *Olympia*. In Syria, however, there are apparently plants whose classification is more difficult because of their closer resemblance to *H. polyphyllum* Boiss. et Bal., a species of the same region. One such is named *H. olympicum* L. var. **stenophyllum** *Stefanoff*, with the diagnosis: folia angustissima, acuta, glandulis pellucidis instructa vel non instructa, marginibus planis haud revolutis; sepala ovato-lanceolata, elongata, apice gradatim attenuata; calyx major ad corollae medium attingens (*A. Péronin*, Pl. de Cilicie no. 12, in Herb. Kew.). In *H. polyphyllum* Boiss. et Bal. the calyx is very reduced in size, being three or four times shorter than the corolla. In general the flowers of *H. polyphyllum* and of *H. Hayekii* Siehe are much smaller than those of any of the varieties of *H. olympicum*.

Hayek, in Ann. Hofmus. Wien xxviii. 159 (1914), reduces *H. Hayekii* Siehe (Flor. Or. no. 542, nomen solum) to a synonym of *H. polyphyllum* Boiss. et Bal., but incorrectly. The two plants are closely related but good characters distinguish them. Thus the stem and leaves in *H. Hayekii* are dark green and intensely glaucous, while in *H. polyphyllum* they are almost pale green. The calyces of both species are small relative to the corolla but the sepals have different shapes. In *H. Hayekii* they are broad and obovate, while in *H. polyphyllum* they are lanceolate-elliptic with many black points on their surface. In the latter also the petals have numerous black points on their margins—a character not observed in *H. Hayekii*.

Hypericum tomentellum *Frey* et *Sint.* in Oesterr. Bot. Zeitschr. 366 (1891). I have had the opportunity of comparing

original material of this species with that of *H. pruina* Boiss. et Bal. and thus to establish the complete identity of the two species. Both were described from specimens collected in the same district of Armenia.

Hypericum cassium Boiss. After comparing Boissier's original plant with much authentic material of *H. Montbretii* Spach from the Balkan Peninsula and Asia Minor, I have reached the conclusion that the two species are really the same. The only important difference in the original diagnoses of the two supposed species is that *H. cassium* is said to have no pellucid dots in the leaves. Bornmüller (l.c. 433) has pointed out the inconstancy of this character, and the examination of a series of specimens of *H. Montbretii* has confirmed Bornmüller's contention that the number and arrangement of the dots on the leaves is a very fluctuating character. They may be entirely absent or occur only in the leaves immediately below the inflorescence. On the other hand a few pellucid dots occur in the upper leaves of the plant originally described by Boissier as *H. cassium*.

The strongly developed polymorphism of *H. Montbretii* Spach probably explains why many plants of it from different localities have been described as distinct species by various authors. To its known synonyms must be added *H. bulgaricum* Davidoff [Trav. de la Soc. Bulg. de Sci. Nat. viii. 59 (1915)] and *H. modestum* Strauski non Boissier [Sbornik na Bulg. Akad. na Nauk. xvi. 116 (1921)]. Though *H. Montbretii* is very polymorphic I am of the opinion that its various forms have little taxonomic importance because of their irregular geographical distribution and their inconstancy.

V.—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: II.* H. N. RIDLEY.

OPILIACEAE.

Lepionurus sylvestris Bl.

BORNEO. Sarawak: Kuching, *Haviland* 1777.

OLACACEAE.

Ximenia americana L.

BORNEO. British North Borneo: East Coast, Mabul island, *Creagh*.

Olex rosea Ridley, sp. nov.; *O. imbricatae* Roxb. affinis, paniculis in axillis singulis longioribus, floribus roseis cum fructibus multo majoribus, bracteis perparvis distincta.

Frutex glaber. *Folia* oblonga abrupte acuminata acuta, basi rotundata, 6–9 cm. longa, 4–4.5 cm. lata, nervis tenuibus conspicuis inter se anastomosantibus; petioli crassiusculi 5 mm. longi. *Paniculae* axillares singulae pubescentes 1 cm. longae, 8–10-florae.

* Continued from *K.B.* 1930, p. 373.

Flores rosei fragrantés brevissime pedicellati; bracteae parvae ovatae pubescentes caducae. *Calyx* infundibuliformis pubescens 1 mm. longus. *Petala* 3 linearia acuta, duobus bifidis, minute scabrido-punctatis, 1 cm. longis. *Stamina* 3aequilonga; staminodia papyracea linearia profunde bifida. *Pistillum* pubescens conicum, tertia parte immersa, cum stylo 4 mm. longum; stigma capitatum obscure trilobum. *Fructus* 2 cm. longus, glaber, in calyce cupuliformi magno 1.5 cm. longo 1 cm. lato ferme omnino inclusus.

BORNEO. Sarawak: near Kuching, *Haviland* 484, 3018 (type), 3118. "Petals pale rose-colour, sweet scented; ovary superior, three-celled, with one ovule in each cell."

This is allied to *O. imbricata* Roxb., but the panicles are solitary in the axils and longer, the flowers pink and much larger, as are the fruits, and the bracts are much smaller.

***Olox multiflora* Ridley**, sp. nov.; *O. imbricatae* Roxb. affinis, paniculis longioribus glabrioribus, floribus saepe unisexualibus petalis 3 distincta.

Frutex vel *arbor*. *Folia* oblonga obtusa basi rotundata vel brevissime cuneata, 12–14 cm. longa 5–6 cm. lata, coriacea, nervis elevatis 5-jugis. *Paniculae* in axillis singulae, puberulae multiflorae 2 cm. longae; bracteae persistentes ovatae; pedicelli 2 mm. longi. *Calyx* patelliformis vix 1 mm. longus. *Petala* 3, linearia, 5 mm. longa, coriacea. *Stamina* 3; staminodia 3, linearia, longe bifida. *Stylus* glaber canaliculatus, stigmatē subgloboso integro.

CELEBES. Penisola S.E. a Lepo-Lepo, presso Kandari, Luglio 1874, *Beccari*.

As *Beccari* notes on the specimens, the flowers are unisexual; in some branches there is a preponderance of male flowers, in others of females.

***Olox laxiflora* Ridley**, sp. nov.; *O. multiflorae* Ridl. affinis sed paniculis elongatis laxis, rachide tenui, floribus multo majoribus, foliis elliptico-lanceolatis majoribus differt.

Frutex vel *arbor* glabra. *Folia* elliptico-lanceolata acuminata basi cuneata, 10–17 cm. longa 4–7 cm. lata, coriacea, nervis 8-jugis conspicuis; petioli crassi 5 mm. longi. *Paniculae* axillares singulae laxae, 3 cm. longae, scabridae subglabrae. *Flores* dissiti; pedicelli graciles 5 mm. longi puberuli. *Calyx* patelliformis 1 mm. longus margine ciliatus. *Petala* 3 lineari-subspathulata 1 cm. longa glabra. *Stamina* 3; staminodia 3, petalis vix breviora, linearia, dimidio trifida. *Pistillum* conicum 1 mm. longum, stylo 1 cm. longo, stigmatē capitato.

KEI ISLANDS. Bandan a Weri, *Beccari*.

This species is allied to *O. multiflora* Ridl., but the panicles are laxer, more glabrous, slender and spreading; the flowers are longer and the leaves larger.

***Anacolosa frutescens* Bl.**

BORNEO. Sarawak: Kuching, *Haviland* 2950.

Gomphandra javanica Valet.

BORNEO. Sarawak: Entoyut River, *Hose* 455, 700; Baram, *Hose* 154.

Ochanostachys amentacea Mast., var. **rufa** Stapf, var. nov.; a typo differt foliis angustioribus lanceolatis, alabastris, ramulis, costa in pagina inferiore, rachide racemorum, ferrugineo-furfuraceis.

BORNEO. Sarawak: near Kuching, *Haviland* 1950; *Haviland & Hose* 3473; *Lobb*.

This form is distinct from *O. amentacea* Mast. [from which I cannot distinguish the Banca and Lingga plant, *O. bancana* (Becc.) Valeton], by the rather narrower long acuminate leaves, and by the red scurf which covers the buds, twigs, rachis of the racemes and midrib of the leaves.

Iodes reticulata King, var. **glabrescens** Ridley, var. nov.; a typo differt caule hirto gracili foliis supra glabris subtus costa parce hirsuta aliter glabris, angustioribus lanceolatis caudatis, 5.5-10 cm. longis 1.5-4 cm. latis.

BORNEO. Sarawak: Kuching, *Haviland* 1651.

This variety is very closely allied to *I. reticulata* King, a native of the Malay peninsula not previously recorded for Borneo, but the whole plant is much more glabrous and the leaves almost completely so. The latter are also more coriaceous and narrower with a distinct long point.

ILICACEAE.

Ilex orestes Ridley, sp. nov.; *I. Havilandii* Loesn. approximatus foliis quintuplo majoribus crassis glabris, floribus majoribus, calyce pubescente differt.—*I. Havilandii* var. *major* W. W. Smith in Notes Roy. Bot. Gard. Edinb. viii. 323 (1915).

Arbor parva. *Folia* oblongo-obovata apice retusa basi angustata, 3-5 cm. longa 1-2 cm. lata, rigide crasse coriacea glabra, supra dense punctata polita nervis costaque depressis, subtus nervis 5-jugis valde inconspicuis; petioli crassi 2 mm. longi. *Racemi* axillares 1.5 cm. longi puberuli. *Flores* pauci albi; pedicelli 2 mm. longi puberuli; bracteae minutae ovatae acutae puberulae. *Sepala* 4, ovata rotundata pubescentia. *Petala* 4, lineari-oblonga obtusa. *Stamina* petalis longiora, antheris ellipticis. *Ovarium* parvum globosum.

BORNEO. Sarawak: Santubong, March 1914, *Native collector* D 167; Bongo Mountains, *Haviland & Hose* 3717. "Small tree; flowers white."

This plant, referred by W. W. Smith to a variety of the small-leaved *Ilex Havilandii* Loesn. of Kinabalu, appears to me very distinct. The leaves are much larger, about five times as big, glabrous and stiffly coriaceous. The flowers are larger, with a pubescent calyx, and the plant is a tree, not a shrub.

Euonymus castaneifolius Ridley, sp. nov. ; *E. Wrayi* King affinis, floribus multo minoribus, foliis majoribus serratis lanceolatis acuminatis distincta.

Frutex ? glaber. *Folia* opposita lanceolata acuminata acuta, basi cuneata, margine in parte superiore serrata, 9.5–16 cm. longa 2–6 cm. lata, rigide coriacea, nervis conspicuis 11-jugis superne depressis, costa elevata ; petioli crassi rugosi 1 cm. longi. *Cymae* axillares graciles pauciflorae, pedunculo 2.8 cm. longo, ramis 2 dichotomis, pedicellis gracillimis 1 cm. longis. *Flores* parvi. *Sepala* rotundata. *Petala* 4, rotundata minute crenulata 2 mm. longa. *Stamina* in disco immersa, antheris conicis. *Stylus* crassus, stigmatibus magno capitato.

BORNEO. Sarawak : near Kuching, *Haviland* 827.

Euonymus Moultoni Ridley, sp. nov. ; *E. Wrayi* King affinis, foliis tenuibus lanceolatis cuspidatis serrulatis, cymis laxis floribus minoribus distincta.

Frutex vel *arbor* parva, glabra. *Ramuli* graciles angulati. *Folia* opposita elliptica cuspidata vel lanceolata basi angustata, margine remote denticulata, 8–9 cm. longa 2.5–4 cm. lata, tenuiter coriacea ; nervis 4–5-jugis superne depressis subtus elevatis ; petioli 5 mm.–1 cm. longi. *Cymae* axillares graciles, pedunculo 4 cm. longo, ramis dichotomis 2 cm. longis ramulis 1 cm. longis, pedicellis 5 mm. longis gracillimis, bracteis minutis ovatis acutis. *Flores* parvi. *Sepala* ovata-rotundata. *Petala* obovata minute denticulata 1 mm. longa. *Stamina* brevissima. *Discus* crassus. *Ovarium* immersum.

BORNEO. Sarawak : Upper Baram, Gunong Tenabok, 4000 ft., *J. C. Moulton* 7675 (type) ; Penkulu Ampat, *Haviland*.

Very distinct in its bullate leaves, the nerves on the upper side as well as the reticulations being deeply sunk in the polished surface. The edges in very young leaves are serrate, in adults they are undulate with short obscure teeth, somewhat distant. The cymes are lax, spreading, and the flowers very small. *Haviland's* single specimen has much broader, more ovate leaves and shorter cymes only 3 cm. long, but it appears to be the same species.

Microtropis rigida Ridley, sp. nov. ; *M. ellipticae* King affinis sed foliis rigide et crasse coriaceis obtusis, petiolis brevissimis, petalis rotundatis, antheris in tubo sessilibus distat.

Arbor ? *Folia* opposita elliptica apice obtusa basi truncata, 9.5–12 cm. longa 5–6 cm. lata, rigide coriacea, nervis 5-jugis tenuibus inconspicuis intra marginem arcuantibus ; petioli crassi 2 mm. longi. *Flores* in axillis congesti ; pedunculi 2 mm. longi, in fructu 5 mm. longi, crassi, bracteis navicularibus acutis coriaceis 2 mm. longis. *Sepala* 5, ovata rotundata minute fimbriata 1.5 mm. longa. *Petala* 5, rotundata coriacea. *Stamina* 5, filamentis connatis tubum efformantibus petalis adnatum, antheris parvis oblongis. *Ovarium*

conicum, stylo crassiusculo. *Fructus* (immaturus) cylindricus, oblongus.

BORNEO. Sarawak : *Beccari* 1702.

This species is most closely allied to *M. elliptica* King, but the leaves are much thicker and more rigid, blunt at both ends, the base truncate slightly retuse, the petioles very short ; the corolla lobes are rounded, and the anthers are sessile on the tube.

Lophopetalum sessilifolium Ridley, sp. nov. ; *L. pachyphyllae* King affinis sed foliis magnis lanceolatis sessilibus distincta.

Arbor parva. *Rami* quadrangulati. *Folia* opposita subsessilia lanceolata acuminata, basi rotundata minute cordata, margine integra, 10–30 cm. longa 5–11 cm. lata, coriacea, nervis conspicuis 12-jugis. *Paniculae* elongatae laxae patentes, 30 cm. longae, ramis remotis angulatis, pedicellis gracilibus, 5 mm. longis, griseis. *Calyx* explanatus 5-lobus, lobis ovatis rotundatis albo-cereis. *Petala* flava ovato-rotundata, 2 mm. longa ferme 2 mm. lata. *Discus* corollam implens, planus, angulatus. *Staminum* filamenta immersa, antheris minutis loculis apice divaricatis. *Capsula* oblonga obtusa basin versus paulo attenuata, 6 cm. longa, valvis pustulatis 2 cm. latis. *Semina* oblonga, 5.5 cm. longa 1.7 cm. lata.

BORNEO. Sarawak : near Kuching, *Haviland* 1744 and 1958. "Small tree ; flowers yellow ; ovules three or more in each cell." Matang, *Ridley* (in fruit).

This species is very distinct in its very large lanceolate sessile leaves, which dry a grey colour, the conspicuous nerves and the midrib, elevated on both sides, being red. The flowers are large and somewhat similar to those of *L. pachyphylla* King.

Lophopetalum subsessile Ridley, sp. nov. ; *L. sessilifolio* Ridl. affinis, foliis multo minoribus distincte petiolatis, petiolis brevibus, floribus minoribus petalis ovatis acutis distincta.

Arbor. *Folia* opposita elliptica vel elliptico-ovata obtuse acuminata basi brevissime attenuata, 5–11 cm. longa 2–5 cm. lata, coriacea, nervis inconspicuis 16-jugis, costa superne elevata ; petioli crassi 4 mm. longi. *Paniculae* subterminales laxae 10 cm. longae multiflorae ; pedicelli 4 mm. longi ; bracteae parvae ovatae acutae. *Calyx* 5-lobus, lobis brevibus rotundatis. *Petala* ovata acuta 2 mm. longa, marginibus undulatis. *Discus* 5-angulatus. *Staminum* filamenta immersa, antheris ellipticis 4-lobatis.

BORNEO. Sarawak : Kuching, *Haviland* 2235.

This resembles *L. sessilifolium* Ridl. in its opposite short-petioled leaves. The leaves, however, are much smaller and elliptic. The flowers also are much smaller and the petals ovate acute.

Lophopetalum Havilandii Ridley, sp. nov. ; nulli speciei arcte affinis, foliis magnis oblongis, paniculis laxis, floribus minoribus, antheris minutis distincta.

Arbor parva glabra. *Folia* alterna elliptica obtuse acuminata, basi breviter angustata, 15–16 cm. longa, 6–7 cm. lata, tenuiter coriacea,

nervis 9-jugis gracilibus superne elevatis subtus depressis; petioli crassiusculi 5-9 mm. longi. *Paniculae* laxae multiflorae axillares et pseudo-terminales, 11-15 cm. longae, ramis dissitis 4 cm. longis vel brevioribus, ramulis 5 mm. longis; pedicelli 1 mm. longi; bractaeae ovatae minutae. *Calyx* patelliformis, lobis 5 rotundatis. *Petala* 5, obovato-rotundata unguiculata, 1 mm. longa, marginibus sinuatis. *Stamina* 5, in disco profunde immersa, antheris minutis subglobosis. *Discus* 5-angulatus angulis petalis alternantibus. *Ovarium* immersum, ovulis paucis.

BORNEO. Sarawak: Lundu, *Haviland* 882.

This plant resembles an *Euonymus* in the small number of ovules and in the small flat flowers with minute anthers. I have placed it under the genus *Lophopetalum*, however, as the large panicles, subterminal as well as axillary, more closely resemble those of the latter genus than those of the former. In the genus *Euonymus* I have seen no plants at all with the characteristic panicle of *Lophopetalum*. The real difference between the two genera lies in the fruit, the seeds of *Lophopetalum* (mostly large trees) being winged for wind-dispersal, those of the shrubby *Euonymi* being arillate and adapted for bird-dispersal. In this species, as in many other cases, fruit has not yet been collected.

Lophopetalum Beccarianum *Pierre* Fl. For. Cochinch. iv. (1894) sub t. 307 (*nomen ferme nudum*).

Arbor. *Folia* lanceolata basi angustata, 12-15 cm. longa, 4.5-5 cm. lata, coriacea, nervis elevatis 7-jugis; petioli crassi 5 mm. longi. *Paniculae* 3-4 in axillis terminalibus, multiflorae laxae 12-15 cm. longae glabrae, ramis inferioribus 5 cm. longis, ramulis 5 mm. longis; bractaeae ovatae acutae 0.5 mm. longae; pedicelli 3 mm. longi. *Sepala* ovato-rotundata, parva. *Petala* obovata 2 mm. longa integra nec carinata. *Discus* planus lobatus lobis rotundatis. *Stamina* brevia immersa. "Ovula 14."

BORNEO. Sarawak: *Beccari* 2475; *Miri*, *Hose* 674.

I make no apology for describing this species, of which *Pierre* gives only a few notes of no critical value. By error he quotes the number as 2495, which is that of a species of *Loranthus*.

Hose's plants differ slightly in the broader more rounded leaves, 14 to 15 cm. long, 7 to 8 cm. wide. His excellent specimens show a number of papillae on the outside of the sepals.

Lophopetalum rigidum *Ridley*, sp. nov.; *L. Beccariano* *Pierre* affinis, foliis multo crassioribus et rigidioribus, petiolis brevioribus, nervis inconspicuis, paniculis brevioribus, petalis denticulatis distincta.

Arbor glabra. *Folia* elliptica acuminata acuta, basi obtusa, 8-12.5 cm. longa, 4-7 cm. lata, rigide coriacea, nervis 6-jugis tenuibus cum costa superne elevatis subtus valde inconspicuis; petioli crassi 4 mm. longi. *Paniculae* subterminales (siccitate rubrae) 5-9 cm. longae, ramis paucis, inferioribus 2.5 cm. longis;

bracteae ovatae acuminatae acutae. Flores brevissime pedicellati. Sepala ovata rotundata 1 mm. longa. Petala oblongo-ovata minute denticulata. Stamina 5, in disco majusculo integro immersa. Ovarium conicum immersum, ovulis paucis, stylo brevi gracili.

BORNEO. Sarawak : near Kuching, *Haviland* 2236.

Stapf, in a note on the specimen in the Kew Herbarium, suggests that it is an *Euonymus* on account of its few ovules, but the plant has completely the habit of *Lophopetalum*.

Lophopetalum multinervium Ridley, sp. nov. ; *L. Beccariano* Pierre affinis, sed floribus paucioribus, foliis ovatis multinerviis differt.

Arbor. Folia alterna ovata vel elliptica obtusa basi inaequilateraliter subrotundata, 11–14 cm. longa 5.5–9 cm. lata, subcoriacea, nervis parallelis 11-jugis subtus cum costa elevatis ; petioli 2–2.5 cm. longi. Paniculae axillares pauciramosae pauciflorae 9 cm. longae, ramis remotis 6 cm. longis ; pedicelli 1 mm. longi. Flores parvi. Calycis lobi 5, ovati acuti. Petala 5, ovata, 2 mm. longa. Stamina 5, in disco inserta.

BORNEO. Sarawak : *Beccari* 3659.

The only specimen I have seen of this is in poor condition, but the species is distinct in its broad, ovate, rounded leaves with numerous elevated nerves.

VI.—FURTHER NOTES ON LACHNOPYLIS.

C. A. SMITH.

During the preparation of the previous paper* on *Nuxia* and *Lachnophyllis*, which was concerned primarily with the South African species of the latter genus, it was found that three groups of specimens from Tropical Africa and Madagascar could not be assigned satisfactorily to any of the known species of *Lachnophyllis*. Descriptions of these are now given below.

L. scytophylla was erroneously included by Baker under his *Nuxia pachyphylla* [i.e. *L. pachyphylla* (Baker) C. A. Sm.], from which it differs in such important characters of the inflorescence, that it is now referred to a different series, namely, *Glomerulatae*.

L. compacta (sp. nov.) is said to be an important constituent of forests in the Imatong Mountains of Southern Sudan, and it therefore seems desirable that it should be named and described. A description of a closely related species, *L. flocculosa* (sp. nov.), is given for purposes of comparison.

The two latter species belong to the series *Laxiflorae*, which comprises by far the greatest number of species in the genus.

L. scytophylla C. A. Sm., sp. nov. ; *L. pachyphyllae* (Baker) C. A. Sm. similis, sed inflorescentia laxa, caulibus folisque glabris, floribus exterioribus haud deflexis facile distinguitur.

*K.B. 1930, pp. 10–32.

Frutex vel *arbor* parva (teste Baker), inflorescentia excepta undique glaber. *Folia* ternatim verticillata, elliptica vel oblongo-elliptica, usque 7 cm. longa et 2.8 cm. lata, basi in petiolum distinctum usque 1.5 cm. longum angustata, firme coriacea, marginibus subrevolutis, utrinque subtiliter reticulata, nervis lateralibus inconspicue elavatis. *Inflorescentia* usque 11 cm. longa et 7 cm. diametro, laxe ramosa, ramis 2-3-furcatis angulatis, partibus novellis pilis brevibus subfuscis pubescentibus. *Flores* in pseudocapitula plus minusve compacta paucifloraque aggregati. *Calyx* campanulato-subcylindricus, circiter 5 mm. longus et 2.5 mm. diametro, triente inferiore extra puberulo, ceterum plerumque glaber. *Corolla* non visa. *Capsula* dense sericeo-pilosa, in calyce persistente plus minusve inclusa.—*Nuxia pachyphylla* Baker in Journ. Linn. Soc., Bot. xxii. 506 (1887), pro minima parte, excl. descr.

CENTRAL MADAGASCAR (sine loc. exact.), *Baron* 1326 ! (type in Herb. Kew.), 4056 ! (Herb. Kew.).

L. flocculosa C. A. Sm., sp. nov. ; affinis *L. sambesinae* (Gilg) C. A. Sm., a qua inflorescentia laxissima et praesertim flocculoso indumento foliorum differt.

Arbor parva vel frutex altus. *Ramuli* superne conspicue angulati foliorum cicatricibus valde prominentibus notati ; versus apices foliosi, tomentosi. *Folia* ternatim verticellata, late elliptica, usque 10 cm. longa et 5 cm. lata, utrinque manifeste angulata, praesertim basin versus, apice acuta, integra, coriacea, eglandulosa, supra glabra, vel interdum pilis parvis paucis hinc inde inspersis ; petioli usque 1.5 cm. longi, dense pubescentes. *Inflorescentia* laxissima, tamen rotundata, multiflora, speciosa, usque 15 cm. diametro, rhachi ter vel quater furcata laxe pubescente. *Flores* fere semper sessiles, raro pedicellis usque 1.5 mm. longis, pubescentibus. *Calyx* campanulatus, usque 5 mm. longus et 2 mm. latus, pilis millobus simplicibus dense pubescens, saepius bilabiatus, labiis integris vel bidentatis, dentibus ovatis obtusis. *Corollae lobis* oblongi, apice cucullati, infra apicem tuberculo calloso onusti, extra sparse setulosi. *Capsula* saepius calyci aequilonga.

TROPICAL AFRICA. Southern Angola : Huilla, Maunyino, Sept. 1900, *Herb. Huilla* 262 ! (type in Herb. Kew. ; also in Herb. Mus. Bot. Berol.).

L. compacta C. A. Sm., sp. nov. ; affinis *L. flocculosae* C. A. Sm., a qua inflorescentia percompacta foliis multo angustioribus differt.

Arbor usque 13 m. (vel ultra) alta. *Ramuli* angulati, versus apices foliosi et dense tomentosi. *Folia* ternatim verticellata, elliptica vel oblonga-elliptica, usque 10 cm. longa et 2.5 cm. lata, apice acuta vel subacuta, inferne in petiolum 1 cm. longum dense pubescentem cuneatim angustata, integra, marginibus subrevolutis, supra viridia, glabra, subtus pallidiora et stellatim pubescentia, conspicue nervata. *Inflorescentia* dense multiflora, compacta, speciosa, usque 7 cm. lata et 4 cm. longa, ubique pilis ramosis

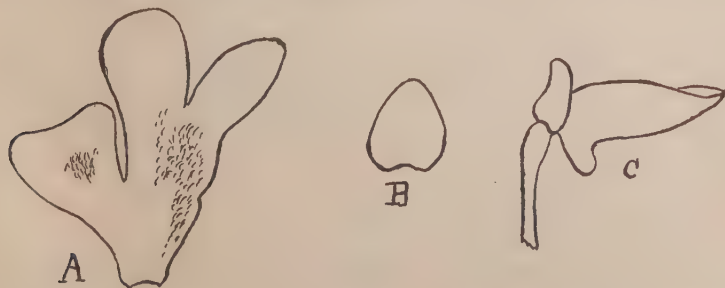
densissime pubescens; rami (rhacheos) bis vel ter furcati. *Flores* subsessiles, vel raro pedicellis usque 1.5 mm. longis. *Calyx* campanulatus, sub fructu subcylindricus, usque 5 mm. longus et 2.5 mm. latus, bilabiatus, labiis integris vel bidentatis vel emarginatis, dentibus ovatis subacutis. *Corollae lobi* oblongi, apice cucullati, infra apicem tuberculo calloso onusti, extra sparsi setulosi. *Capsula* e calyce subexserta.—*Nuxia sambesina* M. B. Moss in Kew Bull. 1929, 190; non Gilg.

TROPICAL AFRICA. Southern Anglo-Egyptian Sudan: above Kippia, in ravines on the Imatong Mts., 32° 50' N., 3° 80' N., 2500–3350 m., Feb. 1929, *Chipp* 95! (type in Herb. Kew.).

VII.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXV.

1241. *Impatiens nilgirica* C. E. C. Fischer [Geraniaceae-Balsamineae]: *I. Akkæ* Bedd. similis sed robustior, folia semper glabra, bracteae multo latiores, flores majores rubri, lobi alarum basales latiores, pedicelli fructiferi reflexi.

Herba erecta, acaulis, alis corollae exceptis glabra; bulbus parvus, globosus. *Folia* 1–2, radicalia, carnosa, suborbicularia vel reniformia, basi profunde cordata, lobis rotundatis, saepe imbricatis, 2.5–4 cm. lata, nervis primariis 7–9, flabellatis, supra obscuris, subtus distinctis, marginibus remote apiculato-crenatis; petioli 3–9 cm. longi, purpurascens. *Scapi* 1–2, usque 20 cm. longi, purpurascens, 4–10-flori; bracteae late ovatae vel suborbiculares, usque 6 mm. longae, concavae; pedicelli purpurascens, 1 cm. longi, fructiferi longiores, reflexi, apice paullo incrassati. *Flores* purpureo-rubri. *Sepala* ovato-falcata, obtusa, basi paullo cordata, 4 mm. longa. *Vexillum* 1 cm. longum, naviculiforme, subacutum, calcari brevi recto obtuso munitum. *Alae* 3-lobatae, fere 2 cm. longae, infra lobos duos superiores et in medio lobi basalis pilosae; lobus basalis late obovatus, obliquus, retusus, 5–6 mm. longus; lobus medius angustior, obovato-oblongus, apice rotundatus, 8 mm. longus; lobus distalis etiam angustior, saepe brevior, oblongus, obtusus. *Labellum* late oblatum, cucullatum, 1 cm. longum,



Impatiens nilgirica C. E. C. Fischer. A, wing; B, bract; C, vexillum; all $\times 2$.

basi subsaccatum, marginibus integris. *Capsula* ellipsoidea, subacuta, 1.2 cm. longa, rigide deorsum porrecta. *Semina* minuta, ovato-oblonga, compressa, glabra.

INDIA. Madras Presidency, on the Kundahs in the Nilgiri Hills, among grass, 2800 m., Sept., *E. Barnes* B 36 (type), B 37; summit of Mukurti Peak, on rocks, *E. Barnes* B 8.

Very like *Impatiens Akka* Bedd. and at first, from the description, taken to be that form of *I. crenata* Bedd.; but, on comparison with Beddome's sheet in the British Museum, the differences noted became apparent.

1242. **Millettia nepalensis** R. N. Parker [Leguminosae-Galegeae]; affinis *M. caudatae* Baker, sed foliolis non caudatis, floribus multo majoribus inter alia differt.

Frutex scandens, cortice pallido lenticellato, ramis primo breviter ferrugineo-velutinis mox glabris. *Folia* 2-3-jugata, 15-20 cm. longa; stipulae 3 mm. longae, caducae; foliola lateralia superiora 8-11 cm. longa, 3-4.5 cm. lata, oblonga, primo ferrugineo-tomentosa mox glabra, apice leviter acuminata, basi rotundata, subcoriacea, nervis 8-12-jugis; petioluli 3-7 mm. longi; stipellae nullae. *Racemi* axillares 8-12 cm. longi, rhachi pedicellis calycibusque dense ferrugineo-velutinis. *Flores* fasciculati, pedicellis 5-7 mm. longis. *Calyx* 6-7 mm. longus et latus, campanulatus, dentibus brevibus. *Petala* praeter apices glabra; vexilli lamina 15 mm. longa, rotunda, basi subito in unguem 5-plo breviorum angustata, subcordata, obscure callosa; alae angustae, oblongae, leviter falcatae, basi semisagittatae; carinae petala latiora, fortiter falcata. *Stamina* monadelphae, vexillare basi solutum. *Ovarium* sericeum, 6-8-ovulatum.

WEST NEPAL. Chusiakana, flowers March, *Bis Ram* 48.

1243. **Sonerila collina** R. N. Parker [Melastomataceae-Sonerileae]; *S. succosae* Ridl. affinis sed habitu, foliis glabris et cymis 1-2-floris differt.

Frutex circiter 50 cm. altus, ramulis glabris. *Folia* in quoque jugo subaequalia, 3-6 cm. longa, 1.5-2.5 cm. lata, elliptica vel elliptico-lanceolata, acuminata, glabra, minute serrata, nervis 3-5 e basi foliorum ortis, ceteris obscuris; petiolus usque 2 cm. longus. *Cymae* terminales, pedunculo 2-2.5 cm. longo suffultae, 1-2-florae; pedicelli 5 mm. longi. *Calyx* circiter 8 mm. longus, tubulosus, glaber, dentibus parvis triangularibus. *Petala* 10 mm. longa, 6 mm. lata, alba, ovata, abrupte acuminata. *Stamina* 3, antheris rostrato-acuminatis, 10 mm. longis. *Capsula* 8-10 mm. longa, obconica, laevis.

BURMA. Mergui district: Myinmolekat, at 1800 m. in forest undergrowth, flowers January, *Parker* 3109.

1244. **Spathichlamys** R. N. Parker, gen. nov. [Rubiaceae-Rondel-etieae]; facie generis *Greeniae*, in tribu insignis propter corollam fissam spathiformem.

Calycis tubus globosus ; limbi lobi 5-6, oblongi, obtusi, persistentes. *Corolla* in alabastro apice paulum inflata ; lobi minuti, imbricati, 2 exteriores sub anthesin antice profunde fissi, revoluti, intus pilosi. *Stamina* fauci corollae inserta, filamentis brevibus ; antherae dorso affixae, versatiles, lineares, apice basique 2-lobulatae. *Discus* tumidus, annularis. *Ovarium* 2-loculare ; stylus filiformis, apice incrassatus, 2-fidus ; ovula numerosa, placentis hemisphaericis septo peltatim affixis inserta. *Capsula* parva, crustacea, globosa, septicide 2-valva, valvis apice 2-fidis. *Semina* angulata et compressa. —Frutex ; folia opposita, petiolata ; stipulae interpetiolares. Flores in cymas terminales dichotome ramosas subscorpioidales dispositi, secundi, breviter pedicellati, bracteis minutis, ebracteolati.

S. oblonga R. N. Parker, sp. unica.

Frutex magnus. *Folia* 10-20 cm. longa, 2.5-5 cm. lata, oblonga vel oblanceolato-oblonga, glabra, integra, acuminata, basi angustata, papyracea, nervis lateralibus 16-18-jugis ; petioli 1-2 cm. longi ; stipulae 8 mm. longae, oblongae, obtusae, extra strigosae. *Cymae* pedicelli calycesque strigosi ; pedicelli ad 3 mm. longi. *Calycis* tubus 1.5 mm. longus, limbi lobi tubo subaequales. *Corolla* 18 mm. longa, extra minute strigosa ; lobi vix 1.5 mm. longi, obtusi. *Antherae* 4 mm. longae. *Stylus* 18 mm. longus, glaber. *Capsula* 3 mm. diametro.

BURMA. Mergui district : in evergreen forest at 1200 m. on Myinmolekat, flowers cream-coloured, January, Parker 3100.

1245. **Stapelia Youngii** N. E. Br. [Asclepiadaceae] ; affinis *S. giganteae* N. E. Br., sed caulibus et floribus minoribus facile distinguitur.

Caules erecti, subconferti, 7.5-12.5 cm. longi, 1.5-2 cm. crassi, 4-angulati, velutino-puberuli, angulis compressis breviter denticulatis. *Folia* 1-2 mm. longa, erecta. *Pedicelli* 0.6-2 cm. longi, 3-4 mm. crassi, puberuli. *Corolla* 12.5-15 cm. diametro ; pars disciformis leviter depressa absque tubo ; lobi 4.5-6.5 cm. longi, 2.5-3 cm. lati, ovato-lanceolati, acuminati ; corolla extra puberula, intus transverse rugosa, loborum parte apicali glabra, ceterum laxe purpureo-pilosa, marginibus pilis simplicibus longe ciliatis, flavida vel viridi-lutea lineis transversis purpureis notata. *Corona* atrata ; lobi exteriores 6 mm. longi, lineari-oblongi, concavi, apice recurvi, truncati, apiculati ; lobi interiores bipartiti, parte anteriore 8 mm. longa subulata erecta recta, parte posteriore 6 mm. longa lanceolata obtusa.

S. RHODESIA. Collected by Mr. R. G. N. Young near Salisbury, *Herb. Moss* 17301.

This fine species is nearly allied to *S. gigantea* N. E. Br. but differs by having smaller stems and flowers, with shorter points to the lobes of the corolla.

1246. **Hornstedtia sulfurea** R. N. Parker [Zingiberaceae-Zingibereae]; affinis *H. megaloscheilo* Ridl. sed antheris villosis, thecis connectivo late discretis, labello sulfureo, deinde pallescente, medio erubescens differt.

Caulis foliosus validus usque 2.5 m. altus, 4 cm. crassus, basi incrassatus, folia circiter 30 gerens. *Folia* 60–90 cm. longa, 7–15 cm. lata, breviter acuminata basi inaequilateralia; petioli 2–3 cm. longi; ligula rotundata, petiolo subaequalis. *Spica* cum pedunculo et floribus 10–12 cm. longa, pedunculo 3–5 cm. longo. *Bractee* exteriores usque 4 cm. longae 2.5 cm. latae, marginibus fulvociliatis; bracteolae 5 cm. longae, tubulosae, unilateraliter fissae, hirsutae. *Calyx* 5 cm. longus, unilateraliter fissus, apice subinteger vel 2–3-fidus, sursum puberulus. *Corollae* tubus 3 cm. longus, lobis oblongis 17 mm. longis. *Labellum* 5 cm. longum, basi rhomboideum dein contractum et iterum dilatatum apice rotundatum, primo sulfureum deinde pallescens et medio erubescens. *Filamentum* 7 mm. longum et latum; thecae minute villosae discretae; connectivum 7–8 mm. latum; appendicula o. *Ovarium* villosum; nectarii glandulae 2, lamellosae, 6 mm. longae.

BURMA. Mergui district: Yanngwa hills at 360 m. elevation, flowers March, *Parker* 2738.

1247. **Cryptocoryne albida** R. N. Parker [Aroideae-Arineae]; affinis *C. Wightii* Schott, sed folia et spatha minora. A *C. Crudasiana* Prain spathae lamina non transverse rugosa inter alia differt.

Caudiculus 5 mm. crassus; radices ferrugineae. *Foliorum* petiolus sensim in laminam transiens, 5–6 cm. longus, usque 3–4 cm. vaginatus; lamina 5–8 cm. longa, 7–15 mm. lata, anguste oblonga, acuta, margine crispato-undulata. *Pedunculus* brevis vagina inclusus. *Spathae* tubus inflorescentiam includens 15 mm. longus 5 mm. latus, superior 4 cm. longus 2–3 mm. diametro; lamina breviter caudato-acuminata, cauda inclusa 2 cm. longa 8 mm. lata. *Inflorescentia* feminea 5-flora, a mascula 2 mm. longa interstitio 7 mm. longo sejuncta; appendix 0.5 mm. longa, late conica.

BURMA. Mergui district. Yanngwa klong, *Parker* 2735.—Common along shady streams in beds of gravel. Spathes dirty white, inconspicuous amongst the pale leaf-sheaths.

1248. **Fimbristylis aggregata** C. E. C. Fischer [Cyperaceae-Scirpeae]; *F. pauperculae* Boeck. affinis, sed robustior, culmis 5-angulatis, foliis planis scabridis, umbellis decompositis, spiculis multo numerosioribus, nucibus trabeculatis differt.

Herba rigida. *Radix* non visa. *Culmi* solitarii (an semper?) basi incrassati, 5-angulati, angulis minute scabridis, usque ad 60 cm. longi; vaginae coriaceae, laxae, acuminatae, glabrae, usque ad 15 cm. longae. *Folia* nulla vel compluria, plana, anguste ligularia, ad apicem obtusum sensim attenuata, culmos aequantia, usque ad 7 mm. lata, extra glabra, intus marginibusque scabrida, costa nervisque numerosis extra prominentibus. *Umbella* decomposita,

spiculis numerosis. *Bracteae* et *bracteolae* lanceolato-caudatae, interdum anguste ensiformes, extra puberulae, intus scabridae, marginibus setuloso-scabridis. *Radii* costati, costis scabridis, primarii circiter octo, 1·5–5 cm. longi; secundarii pauciores, usque ad 2·5 cm. longi; tertiarii 3–4, usque ad 1 cm. longi. *Spiculae* sessiles, 3–8 in quaque umbella aggregatae, ellipsoideae, 5 mm. longae; gluma ima vacua, glumae 6–10 mediae flores hermaproditos gerentes, superiores tabescentes. *Glumae* rubro-brunneae, marginibus pallidioribus: gluma ima ovata, acuta, floriferis minor, vix carinata, extra parce puberula; glumae floriferae explanatae latissime ovatae, obtusae, valde carinatae, breviter cuspidatae, basi obliqua, 3·5 mm. longae. *Rhachilla* partibus glumarum basalibus persistentibus alata. *Stamina* 3, exserta; filamenta plana, 1-nervia; antherae lineares. *Stylus* glaber, nuce paullo longior, 3-fidus, lobis linearibus duas tertias styli aequantibus, breviter villosus. *Nux* trigona, obovoideo-ellipsoidea, 5 mm. longa, pallide brunnea, apice depresso-pyramidata vel subtruncato-apiculata; cellulae extimae breviter transverse oblongae, per 7–11 series in quaque facie superpositae; gynophorum breve.

INDIA. Anamallai Hills of the Madras Presidency, R. H. Beddome.

1249. ***Fimbristylis contorta*** C.E.C.Fischer [Cyperaceae-Scirpeae], *R. complanatae* Link affinis, sed radiis laevibus, spiculis cylindricis contortis longioribus, glumis majoribus marginibus hyalinis, stylis lobisque longioribus, nucibus majoribus cellulis extimis transverse oblongis differt.

Herba erecta; rhizoma robustum, induratum. *Culmi* 1–2, rigidi, teretes, striati vel paullo costati, laeves, 20–50 cm. longi. *Folia* compluria, plana, linearia, abrupte acuta, 7–52 cm. longa, usque 4 mm. lata, glabra, marginibus apicem versus scabridis. *Umbella* decomposita; bracteae 4–5, 8–35 mm. longae, foliis paullo latiores, marginibus scabridis. *Radii* teretes vel interdum subcomplanati, saepe graciles, laeves; primarii 6–8, usque ad 8·5 cm. longi; secundarii 3–4, usque ad 2·8 cm. longi; tertiarii pauci, breviores. *Spiculae* plerumque in radiis ultimis terminales, interdum in furcis sessiles, cylindricae, contortae, 5–12·5 mm. longae, 2 mm. latae. *Glumae* explanatae late ovatae, 2·5 mm. longae, subacutae, carinatae, basi utroque latere excavatae, pallide rubro-brunneae, marginibus hyalinis. *Rhachilla* partibus basalibus glumarum persistentibus alata. *Stamina* 3, exserta; antherae lineares. *Stylus* 1·6 mm. longus, glaber vel parum hirsutus, 3-fidus, lobis linearibus breviter villosis duas tertias styli aequantibus. *Nux* anguste obovata, trigona, 1·1 mm. longa, minute verrucosa, apice depresso-pyramidata, basi in gynophorum brevissimum attenuata, pallide brunnea; cellulae extimae breviter transverse oblongae.

S. INDIA. Courtallum, Heyne in *Herb. Wall.* 3510A (type, in Kew Herb.); Sept. *Madras Herbarium* 12189; Oct. K. C. Jacob 16248; Oct. K. Venkoba Rao 3846, 3847; Travancore, without precise locality, T. F. Bourdillon 145.

1250. *Fimbristylis Narayanii* C. E. C. Fischer [Cyperaceae-Scirpeae]; *F. distichae* Boeck. affinis, umbella saepissime simplici, spiculis paucioribus majoribus, glumis majoribus, nucibus majoribus obpyramidatis differt.

Herba erecta; radix fibrosa. *Culmi* caespitosi, graciles, obtuse quadrangulares, 10–20 cm. longi, glabri vel sparse minute hispiduli; vaginae 3, usque 4 cm. longae, fauce oblique acutae vel truncatae cum limbo brevi, lineari, foliaceo. *Folia* plana, angustissime ensiformia, 4.5–10 cm. longa, 1–2.5 mm. lata, abrupte acuta, glabra; margines sparse minute hispiduli; nervi prominentes. *Umbella* nunc simplex spiculis 2–5, 1 sessili, ceteris pedunculatis, nunc rarius composita radio uno iterum ramoso spiculas 2 alteram sessilem alteram pedunculatam gerente. *Radix* usque 3 cm. longi, capillares. *Bractae* cujusque radii singulae, lanceolatae, cuspidatae, usque 6 mm. longae. *Spiculae* lanceolatae, 5–9 mm. longae (in fructu multo longiores), 2–3 mm. latae. *Glumae* plerumque omnes distichae, interdum superiores plus minus spiraliter dispositae, explanatae late triangulares, subacutae, basi truncatae, 2–3.5 mm. longae, 1.75–2.5 mm. latae, carinatae, glabrae vel carinae minute scabridae, pallide brunneae, margine stramineo, nervis indistinctis; 3 imae vacuae, 6–20 mediae flores hermaphroditos gerentes, paucae superiores tabescentes. *Rhachilla* satis lata, excavata, foveolis utroque latere ala ovata 1 mm. longa munitis. *Stamina* 3, stylum subaequantia; filamenta plana, basi dilatata sensim attenuata. *Stylus* 3-fidus, lobis quartam partem styli aequantibus, vel minoribus. *Nux* obpyramidata, trigona, matura pallidissime brunnea, albo-verrucosa.

INDIA. Travancore: without precise locality, *V. Narayana-swami* 1357 (type, in Kew Herb.), 1194; Naduvathmuzhi, in evergreen forests, Aug., *M. Rama Rao* 1515; without precise locality, Aug.-Sept., *C. C. Calder & M. S. Ramaswami* 212A, 502; Kaldhuruty rock, Sept., *C. C. Calder & M. S. Ramaswami* 806; Courtallam, Oct., *K. Venkoba Rao* 3835; Peermade, Oct., *K. Venkoba Rao* 3896.

VIII.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA. IV. & V.* N. Y. SANDWITH.

IV. THE BAROMALLIS OF BRITISH GUIANA.

Few Arawak vernacular names for trees are more familiar to forest officers and botanists in British Guiana than Baromalli. The name is applied to one of the commonest and largest trees of the rain-forest. It rises to a height of 120–150 feet, with a diameter normally considerably exceeding 18 inches, and the smooth straight trunk is immediately recognised and distinguished from all other trees by the conspicuous external rings which occur at regular intervals. The heartwood is reddish in colour. The tree is abundant

*Continued from *K.B.* 1930, p. 480.

in the greenheart, mora, morabukea and mixed forest types. It is a member of the small Bombacaceous genus *Catostemma*, which was founded on a species collected in Berbice by Robert Schomburgk in 1837 and described by Bentham as *C. fragrans* Benth. Since that date, a second species with large flowers has been found in the colony on a tributary of the Mazaruni River, and was described as *C. Altsoni* in Kew Bull. 1928, no. 9, p. 366. Still more recently, two additional species, *C. micranthum* and *C. praecox*, have been described by Ducke from the Upper Amazons and Rio Negro, and the author has added a key to the known species of the genus (Archivos do Jard. Bot. do Rio de Janeiro, vol. v. p. 165, 1930). This key includes two species, *C. Spruceanum* and *C. grandiflorum*, formerly placed in the genus *Scleronema* Benth., which has been united with *Catostemma* by Hemsley and Oliver (Hook. Ic. Pl. 1986), and by Bakhuisen van den Brink in his recent revision of the Bombacaceae (Bull. Jard. Bot. Buitenzorg, 1924, sér. 3, vi. 217-8), although the two were treated as distinct genera by K. Schumann in Engl. and Prantl, Pflanzenfam. Nachtr. ii. 42-43 (1908). *Scleronema* has a 5-lobed instead of a 2-3-lobed calyx, and much shorter style-branches than *Catostemma*. Of the species enumerated by Ducke all are represented at Kew except *C. (Scleronema) grandiflorum* (Huber) Ducke, which was collected on the Rio Caquetá in Colombia.

Two kinds of Baromalli, both plentiful in different habitats, are distinguished by the Arawak Indians of British Guiana, though not under different vernacular names, and have for long been known to forest officers of the colony, but their existence and the possibility of their proving specifically distinct has not been indicated in recent sketches* of these forests, in one of which—by an unfortunate error—Baromalli is identified in the check list of common names with the Bignoniaceous genus *Tabebuia*. Herbarium botanists at home remained ignorant of this until last year, partly owing to the absence of complete material and partly to lack of information, with the result that the two kinds, although both imperfectly represented, have been hopelessly confused and have both been described and figured as *C. fragrans* Benth. They bear a fairly strong superficial resemblance to each other, and the excellent characters distinguishing them either were not noticed or are to be found on parts of the tree which were not represented.

The botanists of the Oxford Expedition to British Guiana, 1929, guided by Mr. T. A. W. Davis, Assistant Conservator of Forests, who was familiar with the two kinds of Baromalli and their distinct habitats, and by Arawaks who accompanied the expedition, were able to collect and study both near their camp on the Moraballi Creek, Essequibo River, so that it is now possible to define them as species and to decide which of them is the original *C. fragrans*.

* "The Forests of British Guiana," by Miles Haman and B. R. Wood, in Tropical Woods, no. 15, pp. 1-13 (1928).

"Some observations on the forests of the North West District," by T. A. W. Davis, in the Agricultural Journal of British Guiana, vol. ii, no. 3, pp. 157-166 (Sept. 1929).

Both species were out of flower, but fortunately this character is sufficiently represented on older material at Kew.

The Common Baromalli is the huge tree of several types of forest which was referred to at the beginning of this paper. The second kind is known as "Sand Baromalli" or "Baromalli of Wallaba," because of its peculiar habitat in the Wallaba (*Eperua*) forest on a white sandy soil, generally on the summit of low ridges. It is one of the common trees of this kind of forest and like many others is never found away from it except for a short distance over the boundary of the adjoining forest type; the Common Baromalli, on the other hand, never occurs in Wallaba forest, so that the two kinds are not seen together, although they may occur at different levels on the same slope and can be felled and collected on the same day. The Baromalli of Wallaba, owing to its habitat, is naturally a smaller tree than its ally. Mr. P. W. Richards who, with Mr. T. A. W. Davis, made a detailed ecological study of the area which was worked by the expedition, writes as follows:—"The Sand Baromalli is the subdominant species in Wallaba forest and is very abundant. It only strays into the top of the Greenheart forest and gives way to the other species (Common Baromalli) almost as soon as the white sand is left. This is shown very beautifully on the transect which E. B. Martyn and I carried out from Wallaba to Greenheart. The two species do not really overlap in distribution at all. The Common Baromalli has a very wide range of soil, as it occurs in Greenheart, Mixed, Morabukea and Mora. It is possible that the Sand Baromalli occurred in the sandy Mora forest, as did so many of the Wallaba species, but I have not noted the fact."

The most remarkable, as well as the most useful, character distinguishing the two Baromallis is to be found in the leaves of the seedlings, which can always be found in plenty and collected without any difficulty. They were quite unrepresented in the Kew Herbarium, and provide a striking example of the importance of identifying and collecting seedlings in the field. Even if there were no other differences of habitat or mature foliage which could be detected between the two trees, this character is so constant and so obvious that it would immediately separate them as distinct species. As usual, these leaves are extraordinarily different in shape and texture from those of the mature tree, the lamina being thinner, proportionately very long and narrow, and obovate-oblong or oblanceolate in outline, while the apex is conspicuously acuminate or cuspidate instead of rounded or retuse with a minute apiculus. The seedling leaves of the Common Baromalli are compound, with from two to five (usually three) leaflets; the petiole is very long; the lamina of the leaflets is acuminate at the apex, and the acumen is relatively short and broad, more or less triangular in outline. Those of the Sand Baromalli are simple, with a much shorter petiole; the lamina is thinner in texture (this is more noticeable in the field than in the herbarium), and remarkably cuspidate at the apex, with a very long, sharp and extremely narrow "drip-tip," the sides of which are often practically parallel and sometimes involute from near the base. The

lamina tends to be more obovate-oblong or obovate-elliptic than that of the Common Baromalli, which is usually oblanceolate, and the midrib is symmetrical, whereas in the Common Baromalli it is conspicuously excentric in the lateral leaflets. The secondary and tertiary venation is equally reticulate in both species, but the pattern is totally different. That of the leaflets of the Common Baromalli is extraordinarily complex and irregular, almost defying description; the secondary nerves which leave the midrib are nearly horizontal at first, but those which leave the conspicuous arcuate primaries do so at an angle of 90 degrees or more with the primaries, and their direction is consequently obliquely upwards towards the midrib and downwards away from it, but they soon become for the most part indistinguishable in an intricate network of tertiaries. The venation of the leaves of the Sand Baromalli, on the other hand, is neat and regular; all the secondary nerves, both those which leave the midrib and those which leave the arcuate primaries, are more or less horizontal in direction and parallel; they are sinuous in outline, but they anastomose without a break with the nerve which comes to meet them from the lower or upper primary, and their course is always visible. The same is true of the tertiary nerves, which are more or less regular and parallel.

The mature leaves of the two species are very similar superficially both in appearance and outline. A careful examination, however, shows that they retain some of the important differences which were noticed in the leaves of the seedlings. Those of the Sand Baromalli are still obovate-oblong or obovate-elliptic, and both margins are nearly always neatly rounded on to the petiole; whereas the leaves of the Common Baromalli are elliptic or frequently definitely obovate, the base being wedge-shaped, with the margins gradually narrowed into the petiole. The differences in the pattern of the venation are not only retained but are accentuated owing to a difference in texture. The mature leaves of the Sand Baromalli are more coriaceous than those of the Common Baromalli, so that all the nerves are far more impressed on both surfaces, with the exception of the midrib and primary nerves on the lower surface, which are far more prominent. The regularity of the pattern made by the secondary nerves of the Sand Baromalli is more noticeable than before, particularly on the lower surface, on which the tertiary nerves are so much impressed that they are often quite invisible. The mature leaves of the Common Baromalli, on the other hand, are equally reticulate on both surfaces, and the minor venation is just as strong and irregular in pattern as it was in the seedling leaves; the midrib and primary nerves are more prominent on the upper and less prominent on the lower surface than in the Sand Baromalli. Finally, the presence of stellate hairs on the lower surface of the leaves, particularly of the smaller ones, which was just noticeable in the leaves of the seedlings of the Sand Baromalli, becomes more definite in those of the mature tree and is also noticeable on the young

branchlets and petioles; these hairs have not yet been seen on similar parts of the Common Baromalli.

An examination of the herbarium material of *Catostemma* at Kew immediately showed that the leaves of the type specimens of *C. fragrans* Benth. agreed in all respects with those of the Sand Baromalli. This type was collected by Robert Schomburgk (no. 280) in the savannah country of Berbice, a locality which confirms the identification with the sand-loving species. The notes in Robert Schomburgk's mss. are as follows:—"Tree on banks of river, 50 ft. high. Trunk brownish. Branches spreading. Leaves dark green, lucid. Calyx light green. Corolla white. Stamens and anthers yellow. Odoriferous [presumably referring to the flower]." The locality "Berbice, Schomburgk, 1837," is written in Hooker's handwriting on a duplicate sheet of the type; as with so many of Robert Schomburgk's plants, no locality is specified in his manuscript notes preserved at Kew, but no. 280 occurs in a list of savannah species which were doubtless collected in Berbice.

The identity of the Sand Baromalli with *C. fragrans* is thus satisfactorily established. Now it is a curious fact that, with the exception of two sheets, all the specimens of Baromalli hitherto preserved at Kew are referable to this species, and have evidently been collected either in savannah country or in Wallaba forest. This means that, by a remarkable coincidence, no one has apparently hitherto collected material from the common species of the usual types of forest by the rivers and creeks in the north of the colony. The reason may be, perhaps, that the vernacular name was familiar, and had been assigned to *Catostemma fragrans*; or that the tree was too large and too common to be worth felling for botanical material; or that it has rarely been noticed in flower or fruit. The Oxford Expedition found only a few withered flowers on the branch from which their collection was made, and it is possible that the tree flowers in the rainy season between May and July, when collectors avoid the forest.

Fortunately, however, there are two sheets at Kew, bearing leaves, flowers and fruit, which agree exactly with the Oxford Expedition material of the Common Baromalli. They were forwarded to Kew in April, 1891, from the Old Botanic Garden, St. Vincent, where a tree of the Common Baromalli had evidently been cultivated for very many years. These specimens were figured as *C. fragrans* in the *Icones Plantarum* (no. 1986) by Prof. Daniel Oliver, but only the fruit was described, as flowering *C. fragrans* had already been figured and described in the same work (no. 1793) by Mr. J. G. Baker from material collected by Jenman (no. 4336) on the Lower Demerara River. The Jenman specimen is undoubtedly *C. fragrans*, as it agrees with Schomburgk's type and is evidently from a Sand Baromalli. Oliver, therefore, failed to notice the differences in the leaves, and it has come about that the mature leaves and flowers of both Baromallis have been figured in the *Icones Plantarum* under the name *C. fragrans*.

A study of the inflorescences of both species thus fixed in the Herbarium reveals several distinguishing characters which will have to be tested by the collection of better flowering material of the Common Baromalli. The pedicels of the Sand Baromalli are normally longer than those of the common species, and the bracteoles, which are usually three in number, are very small and situated at some distance below the flower or even at the middle of the pedicel. The bracteoles of the Common Baromalli are large and conspicuous (see Oliver's figure) and the point of attachment is close up to the calyx, so that the two overlap. The calyx, petals, stamens and ovary of the two species seem to be very similar. The style, however, is glabrous in the Sand Baromalli except for scattered stellate hairs at the base where it joins the ovary ; whereas the style of the Common Baromalli is stellate-tomentose throughout the lower third of its length. The style-branches of the Common Baromalli are shorter than those of the other species. Both these characters, which were discovered on dissection, are confirmed by the figures of the two species given by Baker and Oliver.

Finally, the fruit of the Common Baromalli, on present evidence, is larger than that of the Sand Baromalli, and the pericarp is smoother and less striate on the outer surface, and very much thicker on the inner side. The seed of the Common Baromalli is said by the Arawaks to be red, that of the Sand Baromalli to be yellow. No further evidence of the colour of the former exists at Kew, but Hohenkerk notes that the seed of the Sand Baromalli is bright orange.

It may be mentioned at this point that a careful description of the anatomy of a tree identified as "*Catostemma fragrans* Benth." is given by David A. Krebs in his paper on "the Persaud Collection of British Guiana Woods" in *Tropical Woods*, no. 13, pp. 13-14 (1928). The herbarium material (*Persaud* 134) of this tree is not represented at Kew, so that it is impossible to say to which of the two species it should be assigned, but it is hoped that the possessors will now be able to settle the question of its determination.

To summarise the above discussion, there are two Baromallis occurring plentifully in different habitats in the forests of British Guiana, which are abundantly distinct both in the field, where they have already been distinguished, and in the herbarium, where they have hitherto been confused. The original species described by Bentham as *C. fragrans* has been conclusively identified with the Sand Baromalli. The Common Baromalli is thus left without a name ; it has no affinity whatever with any of the Amazonian species of *Catostemma*, and only its fruit has been described hitherto, so that it is necessary to define it further as follows :—

Catostemma commune *Sandwith* sp. nov. ; a *C. fragrante* Benth. foliis plantarum incipientium 2-5-foliolatis nec simplicibus, foliolis acuminatis nec anguste longe cuspidatis, foliis maturis basi cuneatis utrinque aequaliter irregulariter reticulatis subtus haud stellatim

pilosis, pedicellis brevioribus, bracteolis conspicuis multo majoribus, stylo triente inferiore tomentoso, fructu majore pericarpio crassiore differt.—*C. fragrans* Oliv. in Hook. Ic. Pl. 1986 (1891), quoad tabulam totam atque descriptionem fructus arboris cuiusdam in insula Sancti Vicenti cultae, excl. exemplis ceteris citatis; non Benth. in Hook. London Journ. Bot. ii. 365 (1843) nec Baker in Hook. Ic. Pl. 1793 (1888).

Arbor excelsa, ad 45 m. alta, trunco laevi annulis externis insignibus regulariter praedito, materie rubescente. *Folia plantarum incipientium* 2-5-foliolata, vulgo trifoliolata; foliola oblanceolata, apice oblique acuminata, acumine triangulari-lanceolato vulgo 1-1.8 cm. longo supra medium 3-6 mm. lato apice obtuso sed costa excurrente terminato, basi attenuata cuneata latere inferiore foliorum exteriorum rotundato excepto, petiolulis brevissimis crassis corrugatis nigrescentibus, 9-32 cm. longa, 3-8 cm. lata, siccitate supra olivacea subtus olivaceo-brunnescentia, utrinque glabra, nitida, chartacea, costa nisi in foliolo mediano conspicue excentrica, utrinque fere aequaliter intricatissime reticulata, nervis primariis in utroque costae latere vulgo 8-12 laete arcuantibus, reticulatione nervorum secundariorum venularumque tertiariarum valde intricata atque irregulari quoqueversus versante; petiolus longissimus, nitidus, glaber, sulcatus, brunneus, 11-28 cm. longus, 1-3 mm. crassus. *Ramuli arboris maturae* crassi, 4-10 mm. diametro, glabri, inferne caticricibus foliorum pedicellorumque delapsorum asperi, foliis versus apicem satis confertis vel in ramulis minimis lateralibus fasciculatis. *Folia matura* elliptica vel obovata, apice rotundata vel late satis profunde retusa, costa excurrente saepius reflexa, basi in petiolum attenuata cuneata, 4-19 cm. longa, 2-9 cm. lata, siccitate supra olivacea nervis brunnescentibus subtus olivaceo-brunnescentia, utrinque glabra, nitida, rigide chartacea vel subcoriacea, utrinque fere aequaliter sed praesertim subtus conspicue reticulata rete venularum prominentium intricato ac irregulari, costa nervisque primariis utroque latere 8-12 utrinque subaequaliter exstantibus; petiolus glaber, 1-9 cm. longus, sub lamina atque basi incrassatus. *Flores* complures, ut videtur saepe 2-5, in axillis fasciculati; bractee basi pedicellorum semicirculares, concavae, extra plus minusve furfuraceo-tomentosae, vix ad 1 mm. longae atque 2 mm. latae; pedicelli pilis stellato-lepidiformibus dense furfuraceo-tomentosi, breves, 0.5-2 cm. longi, ad 1.5 mm. lati; bracteolae binae, supra medium pedicellum vel sub flore positae, conspicuae, mox caducae, ovatae, obtusae, utrinque pilis stellatis confertis dense tomentosae, 5-6 mm. longae, ad 4.5 mm. latae. *Calyx* extra dense stellato-tomentosus, intus marginibus loborum exceptis glaber, in lobos 2 fissus; tubus campanulatus, demum versus basim circumscissus, circiter 4 mm. longus, 3-4 mm. latus; lobi ovati, ad 7 mm. longi, 6 mm. lati. *Petala* glabra, oblongo-spathulata, obtusa, circiter 1.2 cm. longa, 4-5 mm. lata. *Stamina* circiter 8 mm. longa, glabra. *Ovarium* ovoideum, dense tomentosum, 2.5 mm. longum, ad 2 mm. diametro; stylus ad 1.3 cm. longus, triente inferiore

tomentosus, ceterum glaber, stigmatibus 0.75–1.5 mm. longis. *Fructus* jam a cl. Olivero optime descriptus atque tabulatus, oblongo-ellipsoideus, 8–10 cm. longus, 3.5 cm. diametro, siccitate dense minute ferrugineo-tomentellus; semen oblongo-subcylindricum, ad 7.5 cm. longum, ad 3.5 cm. diametro, testibus incolis rubrum.

BRITISH GUIANA. Moraballi Creek, Essequibo River, August 25th, 1929, *Sandwith* 116 (type); *ibid.* (seedling leaves), October 9th, 1929, *Sandwith* 435.—Old Botanic Garden, St. Vincent, comm. *H. Powell*, April 1891; these specimens, taken from a cultivated tree, were figured by D. Oliver, *vide supra*.

Vernacular name (Arawak), Baromalli or Common Baromalli.

The type material was collected from a tree over 130 feet high, which was used as an observation-post by the ornithologists of the Expedition.

It seems advisable to add a similar detailed description of the Sand Baromalli, and to conclude with some remarks on the third Guiana species.

***Catostemma fragrans* Benth.** in Hook. London Journ. Bot. ii. 365 (1843); Baker in Hook. Ic. Pl. 1793 (1888).

Arbor mediocris vel haud valde excelsa, 15–30 m. alta, in terra arenosa, saepius in eperuetis frequentissime crescens, nunquam juxta *C. commune* reperta. *Folia plantarum incipientium* simplicia, obovato-oblonga vel obovato-elliptica, apice nunc rotundata fere truncata nunc attenuata, semper insigne longe anguste cuspidata, cuspidate lineari-subulata 1–5 cm. longa supra medium 0.75–2.5 mm. lata apice truncato vel obtuso marginibus nonnunquam paullo involutis, basi in petiolum plerumque rotundata, 12–38 cm. longa, 3–10.5 cm. lata, siccitate supra olivacea, subtus brunnescentia, utrinque glabra vel juniora subtus pilis stellatis rarissimis secus nervos conspersa, nitida, saepe magis tenuiter chartacea quam ea *C. communis*, costa centrali, utrinque praesertim supra subtilissime pulcherrime reticulata, nervis primariis in utroque costae latere vulgo 8–12 laete arcuantibus, reticulatione regulari, nervis secundariis omnibus plus minusve horizontalibus parallelisque sinuatis, venulis tertiariis plus minusve verticalibus atque parallelis; petiolus satis brevis, glaber vel parcissime stellato-pilosus, sulcatus, brunneus, 2.5–8.5 cm. longus, ad 2 mm. crassus, apice sub lamina incrassatus nigrescens. *Ramuli arboris maturae* sulcati, 3–8 mm. diametro, juniores plus minusve copiose stellato-pilosi, adulti glabrescentes. *Folia matura* obovato-oblonga vel obovato-elliptica, apice ut in *C. communis*, basi in petiolum rotundata, 2.8–22 cm. longa, 1.2–10.5 cm. lata, siccitate plus minusve olivacea subtus brunnescentia, utrinque fere glabra sed subtus secus nervos—saepius etiam in facie foliorum minorum—pilis stellatis parce vel satis copiose conspersa, nitida, subcoriacea vel coriacea eis *C. communis* crassiora, costa nervisque primariis in utroque latere vulgo 8–12 supra impressis subtus valde exstantibus, reticulatione utrinque praesertim subtus obscura impressa, regulari, nervis secundariis praesertim subtus

conspicue subhorizontalibus parallelisque, tertiariis subtus saepe vix vel haud distinguendis; petiolus stellato-pilosus, 0.5-5 cm. longus. Flores albi, fragrantés, complures in axillis fasciculati; bracteae eis *C. communis* subsimiles; pedicelli stellato-tomentosi, 1.5-4 cm. longi; bracteolae 2-3 in medio pedicello vel supra positae, nonnunquam distantes, parvae, ovatae, obtusae, utrinque tomentosae, 1-2.5 mm. longae, ad 2 mm. latae. Calyx ut in *C. communis*; tubus 3-4 mm. longus, 4-5 mm. latus; lobi ovati, ad 9 mm. longi, 6-7 mm. lati. Petala glabra, oblongo-spathulata, obtusa, ad 1.3 cm. longa, latitudine variabili ut videtur 3-7 mm. Stamina ut in *C. communis*. Ovarium dense tomentosum, ovoideum, ad 4.5 mm. longum, ad 3.5 mm. diametro; stylus ut videtur ad 1.1 cm. longus, basi ipsa excepta glaber, stigmatibus ad 3 mm. longis. Fructus monospermus, oblongo-ellipsoideus, 4-7 cm. longus, ad 3.5 cm. diametro, siccitate dense minute ferrugineo-tomentellus, pericarpio quam in *C. communis* extra magis striato intus multo minus crasso; semen oblongo-subcylindricum, purpurascens, laeve sed passim granulatum, 4 cm. longum, 2.3 cm. diametro, testibus incolis atque cl. Hohenkerk flavum vel laete aurantiacum.

BRITISH GUIANA. Berbice, 1837, *Robert Schomburgk* 280 (type); Lower Demerara River, Jan. 1888, *Jenman* 4336 (type of Ic. Plant. 1793); sandy soil, Mora-mora-bisi Creek, Mapenna River, Corentyne River, April 1918, *Hohenkerk* in Forestry Department record no. 704; hill-top, Kamwatta Creek, Koirimap River, Pomeroon River, July 1918, *Hohenkerk* in ditto, no. 704A; Kuruduni River, Demerara River, July 1920, *Hohenkerk* in ditto, no. 704B; in Wallaba forest on sandy ridge, Moraballi Creek, Essequibo River, Oct. 1929, *Sandwith* 485 (leaves of mature tree and of seedlings).

Vernacular name (Arawak), Sand Baromalli or Baromalli of Wallaba.

Catostemma Altsoni *Sandwith* in Kew Bull. 1928, no. 9, p. 366.

This species was described at some length, and no further material has been seen. Its affinity with the Sand Baromalli (*C. fragrans*) is clearly indicated by the low height of the tree, by the long pedicels, the small bracteoles and the glabrous style. The flowers of *C. Altsoni* are much larger in all their parts, while the leaves are more elliptical and considerably more coriaceous, so that the reticulation of the lower surface, which is irregular and more like that of *C. commune*, is even more impressed. Again, no stellate hairs have been seen on the petioles or leaves of *C. Altsoni*. The Arawak vernacular name was noted by Altson as "Cou-yami."

V. SAPROPHYTES COLLECTED BY THE OXFORD UNIVERSITY EXPEDITION TO BRITISH GUIANA, 1929.

The saprophytes enumerated below were collected by the botanists of the Oxford Expedition within a two-mile radius of the camp on the Moraballi Creek, Essequibo River, which was occupied from early August to the middle of November. A prolonged rainy season was

favourable to the appearance of these curious and delicately beautiful little plants, which were found in plenty throughout the month of August, and seemed to become much scarcer with the arrival of the dry season. The number of species discovered in this small area is significant, as it includes three which are described here for the first time, three more which were recently described by Dr. H. A. Gleason, and another which appears to be a first record for the colony. Most of these were found on more than one occasion, and several were comparatively frequent, though occurring in small quantity.

The species are members of the *Gentianaceae* and *Burmanniaceae*, with the exception of a single Orchid, and a species of *Balanophoraceae* which is included here because of the similarity of its habit. The large majority, as would be expected, preferred the darkest type of forest with the richest, deepest leaf-mould on its floor. The morabukea forest-type, on the slopes of ridges, was therefore the most profitable locality in which to search, and here numerous species would always be found, often growing in company near the bases of trunks or between the buttresses, and frequently accompanied by the remarkable fern *Schizaea fluminensis* Miers. The yellow-flowered *Leiphaimos aphylla* was an exception, as it showed a definite preference for the more open, sandy wallaba forest on the tops of ridges where the light penetrates. Another species, *L. tenella*, was nearly always found at the foot of greenheart. A definite habitat can also be assigned to *Campylosiphon purpurascens*, which was never found away from the mud of actual swamps, either of palm or mora.

A lesson has been learnt from the failure to identify several of the smaller species of the genus *Gymnosiphon*, owing to the incompleteness of the material. Some of the species were quite frequent, and were in perfect flowering condition in the field. They almost certainly represent species which have not hitherto been recorded from the colony, or which have not been described. Yet it is impossible now to do anything with the dried material, as the perianth segments and half the tube have either fallen off or are unfit for dissection. Future collectors in British Guiana should therefore preserve these species in spirit before the otherwise almost inevitable circumscission of the perianth has taken place; or, alternatively, they should take careful notes in the field of the measurements of the flower and of the important specific characters of the stamens and style-branches. It need hardly be added that, owing to the similarity between the white-flowered species, a separate number must always be given to every gathering, even if only a single specimen is found.

GENTIANACEAE.

Voyria rhodochroa *Sandwith* sp. nov.; *V. roseae* Aubl. affinis, corollae lobis obtusis oblongo-spathulatis differt.

Caules fastigiato-ramosi; rami rubri, corymbosi, 1-7 cm. longi, 1-3 mm. lati, carnosi, sulcati, satis dense foliati. *Folia* squamosa,

opposita, basi connata, triangulari-lanceolata vel ovata, obtusa vel subacuta, 2-5 mm. longa, 2-3 mm. lata, minutissime tomentella, inferne internodiis ad 1 cm. longis sejuncta, sursum sub floribus imbricatum conferta. *Flores* apice ramulorum summorum brevium in fasciculum corymbosum saepe multiflorum congregati, supra squamas summas brevissime pedunculati. *Calyx* ruber, brevis, cylindrico-campanulatus, sub lente plerumque minutissime papilloso-tomentellus; tubus 3-6 mm. longus, 3-4 mm. latus; dentes breves, triangulares, obtusi, inaequales, 1-2.5 mm. longi, basi ad 2 mm. lati. *Corolla* pulcherrima, hypocraterimorpha, minutissime papilloso-tomentella; tubus albo-carneus, 3.2-4.2 cm. longus, ut in *V. rosea* basi circa ovarium ac apice circa genitalia ad 4 mm. latitudinem ampliatus, apice fere campanulatus ac intus dense pilosulus, sub lobis levissime contractus, ceterum cylindricus angustissimus 1-1.5 mm. latus; lobi pulcherrimi, laete rosei, oblongo-spathulati, obtusi, patuli, 5-10 mm. longi, 2-3.5 mm. lati. *Stamina* prope basim partis tubi superioris campanulato-ampliatæ inserta; filamenta brevissima; antherae 1.5 mm. longae. *Ovarium* glabrum, anguste ellipsoideum, circiter 8 mm. longum atque 2.5 mm. diametro, sensim in stylum glabrum 2.5 cm. longum attenuatum; stigma antheras paullo superans, sinuato-peltatum, fere ad 2.5 mm. latum.

BRITISH GUIANA. Essequibo River; Moraballi Creek, in mixed and morabukea forest, August 21st, 1929, *Sandwith* 82. Found on only two occasions. Stems and branches tufted as in *Clavaria* spp. Stems and calyx red. Corolla tube flesh-white; lobes a beautiful wild-rose pink.

Voyriella parviflora Miq. Stirp. Surinam. Sel. 147 (1850).

In morabukea-greenheart forest near the Moraballi-Wineperu Divide, August 28th, *Sandwith* 134. Fl. white. Calyx segments very conspicuous and chaffy, white.

Distr. Surinam, *Miquel*. Rio Uaupes, Brazil, *Spruce* 2834 in part.

Apparently the first record from British Guiana. The specimens agree very well with *Miquel*'s syntypes at Kew.

Examination of the scanty material of this genus in the Kew Herbarium reveals the presence of a second, very distinct species, with much larger, more chaffy, upper scale-leaves, much larger floral parts, and longer style. This was collected by *Spruce* on the Rio Uaupes at the same time as *V. parviflora*, and the two species were distributed under the same number, 2834; but *Spruce* noted that "these specimens were gathered widely apart and may belong to more than one species." Good material of this new species has recently been collected by Mr. A. A. Abraham in British Guiana, and it may be described here as follows:—

Voyriella oxycarpha *Sandwith* sp. nov.; a *V. parviflora* Miq. foliis heteromorphis, superioribus ut bracteis anguste lanceolatis longe acute attenuatis vel aristatis, omnibus partibus floralibus atque fructescentibus multo longioribus differt.

Caulis simplex vel infra medium in ramos binos aequales bifurcatus, 3–8 cm. altus, dense foliatus. *Folia* squamosa heteromorpha; inferiora plus minusve ut in *V. parviflora* parva, ovata vel ovato-lanceolata, obtusa, 1–2 mm. longa atque lata; superiora sensim longiora angustiora ac acutiora, summa anguste lanceolata, longe anguste acutissime attenuata vel aristata, 5–8 mm. longa, basi ad 1.5 mm. lata; internodia 2–10 mm. longa. *Inflorescentia* apice caulis ut in *V. parviflora* dense simpliciter vel composite cymosa; raro etiam flores singuli vel gemini versus basim caulis lateraliter surgunt; bracteae foliis summis simillimae. *Flores* pedicellis 1–2 mm. longis. *Sepala* ad basim libera atque basi imbricata, lanceolato-subulata, acutissime angustissime longe attenuata, 7–9 mm. longa, basi vulgo 1 mm. lata. *Corolla* 7.5 mm. longa, tubo cylindrico fere 2 mm. lato; lobi triangulares, brevissimi, ad 1 mm. longi atque lati. *Stamina* circiter 3 mm. supra tubi basim inserta; filamenta ad 1.2 mm. longa; antherae oblongae, 1 mm. longae, apiculo connectivi ad 0.5 mm. producto. *Ovarium* ovoideo-ellipsoideum, 2 mm. longum, vix 1 mm. diametro; stylus 3 mm. longus. *Fructus* maturescens satis anguste ovoideo-ellipsoideus, 4–5 mm. longus, vix 1.5 mm. diametro, sensim in stylum 2–3.5 mm. longum attenuatus; stigma tum conspicue bilobum.

BRITISH GUIANA. Berbice County; Yawakuri, alt. 70–80 ft., growing on dead leaves, June 2nd, 1919, *Abraham* 163 (type).

BRAZIL. In shady forests by the Rio Uaupes, January, 1853, *Spruce* 2834 in part.

The sepals of *V. parviflora* are 3–5 mm. long, the ripening capsule 2–2.5 mm. long, and the style only 1 mm. long or often less.

Leiphaimos aphylla (*Jacq.*) *Gilg* in Engl. et Prantl, Pflanzenfam. iv. 2. 104 (1895). *Gentiana aphylla* Jacq. Enum. Pl. Carib. 17 (1760); Ic. Sel. Stirp. Amer. t. 60, f. 3 (1797).

On leaf-mould and rotten stumps in mora and wallaba forest, August–November, *Sandwith* 266.

Distr. Widely distributed over the West Indies and Tropical South America.

This golden-yellow species is the commonest of the group, and was distinguished in this locality by a marked preference for the wallaba forest where there was plenty of light, a factor notoriously shunned by most saprophytes.

L. corymbosa (*Splitg.*) *Gilg* in Engl. et Prantl, Pflanzenfam. iv. 2. 104 (1895). *Voyria corymbosa* Splitg. in Tijdschr. Nat. Geschied. vii. 136, pl. ii. f. 4 (1840). *Voyra nivea* Miq. in Linnaea xix. 140 (1847). *Leianthostemon niveus* Miq. Stirp. Surinam. Sel. 148 (1850). *Leiphaimos nivea* *Gilg* l.c.

Plentiful in dark forest, August 16th, *Sandwith* 26. Stem and flowers pure white. Inflorescence sometimes reduced to a single terminal flower; usually three to four times dichotomously cymose. *Distr.* Surinam and British Guiana.

The syntype of *L. corymbosa* was borrowed from Leyden, and was found to be indistinguishable from that of *L. nivea* at Kew. The supposed difference in the colour of the flowers (lilac or white) is probably negligible.

L. (§ *Disadena* Gilg) **tenella** (Hook.) Miq. Stirp. Surinam. Sel. 149 (1850). *Vohiria tenella* Hook. in Hook. Bot. Misc. i. 47, t. 25 B (sphalm. *tenera*) (1829). *Voyra tenella* Guild., Griseb. Gen. et Sp. Gent. 207 (1839). *Voyria tenella* Guild., Progel in Mart. Fl. Bras. vi. pars i. 223 (1865). *V. nuda* Splitg. in Tijdschr. Nat. Gesch. vii. 134, pl. i. fig. 2 (1840). *Leiphaimos?* *nuda* Miq. l.c. *Voyria brachyloba* Griseb. Cat. Cub. 181 (1866). *Leiphaimos brachyloba* Urb. in Arkiv. Bot. xxi A. no. 5, 58 (1927).

In greenheart and mixed forest, August 28th, *Sandwith* 135. Stem white. Fl. bluish-mauve.

Distr. West Indies, Guiana, Brazil.

L. tenella was unfortunately misrepresented from the start by Hooker, who described the corolla lobes as rose-coloured, and failed to discover the presence of the stipitate gland on each side of the ovary. This naturally misled Grisebach and Progel, the latter placing the species in the wrong section of his key in the Flora Brasiliensis. The type specimens in the Kew Herbarium are accompanied by a coloured drawing and notes by Guilding, who discovered the plant in St. Vincent. The corolla lobes are coloured bluish-mauve and the stems yellowish-white, and Guilding himself writes that the "petals" are "pale purple." The glands on the ovary are clearly visible on the type specimens, and there can be no doubt from a comparison with Splitgerber's description and figure that the species is conspecific with the Surinam *L. nuda* (Splitg.) Miq., and that Splitgerber overlooked the calyx which is often deciduous or difficult to make out in these plants. The type material of *L. brachyloba* in Herb. Kew. is very poor, but it is a very good match with *L. tenella*.

BALANOPHORACEAE.

Helosis cayennensis (Sw.) Spreng. Syst. iii. 765 (1826). *Cynomorium cayennense* Sw. Fl. Ind. Occ. i. 13 (1797). *Helosis guianensis* L. C. Rich. in Mém. Mus. Par. viii. 416, t. 20 (1822); Eichl. in Mart. Fl. Bras. iv. pars ii. 23, tt. iv-vi (1869).

Among rotten logs in mora and palm swamp, and in adjoining mixed forest, Nov. 16th and 18th, *Sandwith* 620. Parasite with far-spreading, much-branched, horizontal, bone-white rootlets with orange tips, the main branches up to 5 mm. in diameter. Tube of volva 7-8 mm. long and 1 cm. wide, split at the apex into four broadly triangular lobes about 5 mm. long and 6 mm. broad. Stems 3-18 cm. high and 9 mm. in diameter, pale mauve to dull brownish-mauve, scurfy all over, warty at the top. Scales of the anthophore pinkish-mauve, turning pale ochre with age, 4-5 mm. in diameter, tipped with a short dark setaceous apiculus. Styles whitish-hyaline. Male flowers appearing quincuncially at intervals of

4-5 mm. on the older brownish-mauve anthophore, their base surrounded by whitish-hyaline paleae which are tipped with reddish spots; perianth tube white, up to 4 mm. long; lobes white below, reddish-purple towards the apex, 2-3 mm. long. Common filament white, 5-7 mm. long.

Distr. Trinidad and Northern South America; possibly also in Guatemala and Cuba.

BURMANNIACEAE.

Dictyostega Schomburgkii Miers in Trans. Linn. Soc. xviii. 542 (1841), var. **parviflora** Benth. in Hook. Kew Journ. Bot. vii. 13 (1855).

In mora-greenheart forest, once found, October 31st, *Sandwith* 540. Fl. white, very small.

Distr. British Guiana. French Guiana, Sagot 1164 in part. Rio Uaupes, Brazil, *Spruce* 2623 (type).

Urban (Symb. Antill. iii. 442) refers Sagot's specimen to *D. orobanchoides* Miers, but he does not appear to have examined *D. Schomburgkii* and its variety. Typical *D. Schomburgkii* occurs in British Guiana and in Trinidad (*Fendler* 597).

Miersiella aristata *Sandwith* sp. nov.; *M. umbellatae* (Miers) Urb. atque *M. costatae* (Miers) affinis, colore albo, squamis caulinis bracteisque insigne longe aristatis differt.

Radix et dense imbricato-squamosa et longe fibrillosa generis typica. *Caules* 1-2 albi, distincte sulcati, 5-11 cm. longi. *Folia* squamosa, numerosa, a se 4-7 mm. distantia, siccitate brunnea, 4-7 mm. longa, 0.5-1.5 mm. lata, margine saepius lacerata vel fimbriata, sensim conspicue longe aristata, arista e caule exstante vel saepe reflexa. *Inflorescentia* umbelliformis, alba, 3-9-flora; pedicelli erecti, subteretes vix sulcati, 3-6 mm. longi; bractee foliis simillimae, confertae, dimidio superiore reflexo. *Perianthium* tubo ovoideo-cylindrico cum ovario ad 2.5 mm. longo, 2 mm. lato; lobi 6, majores late triangulari-ovati, fere ad 1 mm. longi, 0.75 mm. lati, minores ad 0.5 mm. longi, multo angustiores. *Stamina* ut in speciebus affinibus. *Ovarium* ad 1.5 mm. altum, uniloculare, apice gibbis glandulosis tribus sessilibus ut videtur supra apices placentarum dispositis praeditum; stylus cum stigmatibus ad 1.5 mm. longus.

BRITISH GUIANA. Essequibo River; Moraballi Creek, in morabukea forest, August 27th, 1929, *Sandwith* 131.

It was noticed on several occasions, and was evidently frequent.

The following new combination should be made here: **Miersiella costata** (Miers) *Sandwith*, comb. nov. *Dictyostega costata* Miers in Trans. Linn. Soc. xviii. 542 (1841). This is very closely allied to *M. umbellata*, and perhaps insufficiently distinct from it, a fact which was evidently overlooked by Urban, since he saw no specimens and the plant was not figured by Miers. *Glaziou* 18560, cited by Urban in Symb. Antill. iii. 439 as *M. umbellata*, agrees better with the type specimens (in the British Museum) of *M. costata* than with those of *M. umbellata*.

Cymbocarpa saccata *Sandwith* sp. nov.; a *C. refracta* Miers perianthii tubo basi supra ovarium in annulum insignem saccis 5 compositum producto differt.

Planta sordide albo-lutea, 7-17 cm. alta; caules gracillimi, simplices, aut ramo singulo circiter e medio exoriente praediti; internodia plurima, sensim versus apicem longiora, 0.2-2.2 cm. longa. *Folia* atque *bracteae* ut in *C. refracta*. *Inflorescentia* semel cymose divisa, cum flore in angulo divisionis, 2-5-flora; rami ad 2.5 cm. longi; pedicelli brevissimi. *Flores* post anthesin subhorizontaliter positi; perianthii tubus post anthesin circumscissus ad 2.5 mm. longus, basi supra ovarium in annulum saccorum quinque globosorum vertice ovarii latiore insigni amplius. *Ovarium* forma generis typica, maturitate 2-3 mm. longum, 1-2 mm. latum; ovulis, funiculis, placentis, glandulisque internis omnino ut in *C. refracta*.

BRITISH GUIANA. Essequibo River; Moraballi Creek, in morabukea forest, August 27th, 1929, *Sandwith* 132. Fl. creamy-white.

The circumscission of the perianth tube has taken place in every flower except a single young one which has not been dissected. In this the whole perianth above the ovary is nearly 3 mm. long, and the curious ring of sacs which forms at the base of the tube is already noticeable though not conspicuous. This character is a remarkable and constant feature of the mature flower, and immediately distinguishes the species from *C. refracta*, of which there are numerous specimens in Herb. Kew. from Cuba and Brazil.

Gymnosiphon breviflorum *Gleason* in Bull. Torrey Bot. Club lvi. 22 (1929).

In greenheart forest, November 4th, *Sandwith* 706.

Distr. British Guiana.

G. guianense *Gleason* l.c.

At foot of a mora, August 14th, *Sandwith* 11. Plant wholly white.

Distr. British Guiana, frequent.

G. Altsoni *Gleason* l.c. 23.

In deep shade in morabukea forest, August 27th, *Sandwith* 130, a perfect match with the type. Stem mauve. Flowers solitary or in pairs, white, tinged with mauve at tip. The three perianth segments have a central ridge of a creamy biscuit colour.

Distr. British Guiana, hitherto known only from the Kurupung River, Mazaruni River.

Campylosiphon purpurascens *Benth.* in Hook. Ic. Pl. lxx. t. 1384 (1882).

Swampy edge of small creek in mora forest, October 6th, coll. T. A. W. Davis, *Sandwith* 383; in a palm swamp, November 4th, *Sandwith* 553. Stems and buds white; scales brown. Outer floral whorl white, inner mauve in 383, white in 553.

Distr. British Guiana ; Brazil (Rio Negro and Rio Uaupes) ; Venezuela (Rio Negro).

ORCHIDACEAE.

Wulfschlaegelia calcarata Benth. in Journ. Linn. Soc. xviii. 342 (1881) ; Cogniaux in Mart. Fl. Bras. iii. pars iv. 243, t. lvii. f. ii (1893).

On leaf-mould on the edge of mora swamp forest, October 15th, *Sandwith* 455 ; similarly in dry mixed forest, October 22nd, *Sandwith* 501. Stem dull whitish-mauve. Ovary and flowers (with conspicuous spur) bone-white. Only a single specimen was found on each occasion.

Distr. Trinidad ; British and French Guiana ; Rio Uaupes, Brazil. Previously collected in British Guiana on the Aruka River, September 1897, in *Thurn* 225.

IX.—IDENTIFICATIONS OF SOME TYPES IN THE HERBARIA OF THUNBERG AND LAMARCK.

N. E. BROWN.

By the courtesy of Dr. N. E. Svedelius I have been able to examine the types of the South African species of *Buddleja* and *Capraria* preserved in Thunberg's herbarium, and by that of Prof. H. Lecomte the type of a species of *Eriocaulon* in Lamarck's herbarium, and give below the result of my comparison of them with specimens at Kew.

Buddleja incompta Linn. f. This name is omitted from the "Flora Capensis," but the type specimen is identical with *Gomphostigma incanum* Oliver, which becomes *G. incomptum* (Linn. f.) N. E. Brown in Kew Bull. 1929, 143.

Buddleja virgata Linn. f.=*Gomphostigma scoparioides* Turcz.=*G. virgatum* (Linn. f.) Kuntze.

Capraria lanceolata Linn. f.=*Freylinia oppositifolia* Spin.=*F. lanceolata* (Linn. f.) G. Don.

Capraria longiflora Thunb. This name is omitted from Dyer, "Flora Capensis," but the type matches that of *Freylinia longiflora* Benth., which in my opinion is distinct from *F. undulata* Benth. and not a mere variety of that species as given in the "Flora Capensis." *F. longiflora* was published as a new species, not as a new combination for *Capraria longiflora*.

Capraria rigida Thunb.=*Ehretia hottentotica* Burch.=*E. rigida* (Thunb.) Druce.

Capraria undulata Linn. f.=*Freylinia undulata* (Linn. f.) Benth. The type comprises both glabrous and pubescent forms that are exactly equivalent to *F. undulata* Benth. and *F. undulata* var. *pubescens* Benth. respectively.

Eriocaulon minimum Lam. Encycl. iii. 275. This is a native of Ceylon, but the name is entirely omitted from Trimen and Hooker, "Handbook to the Flora of Ceylon." Upon comparison with the Kew material I find it to be identical with *E. Trimeni* Hook. f., which must now rank as a synonym of *E. minimum* Lam.

X.—MISCELLANEOUS NOTES.

In the recent New Year Honours List the Director was appointed a Knight Commander of the Most Distinguished Order of St. Michael and St. George.

The Director has been elected an Honorary Life Member of The Botanical Society of South Africa.

Psyllium Seeds.—It is evident that the use of Psyllium Seeds (*Plantago Psyllium* L., the "Fleawort" or "Fleaseed") for medicinal purposes is becoming more widespread. The seeds have always been a fairly common commodity in certain Continental countries, such as France and Spain, where they are held in high repute as a laxative and are one of the well-known domestic medicines, but outside Europe and the near East they have been comparatively little known and used. At the present time, however, there is a brisk demand for the seeds in the United States and signs are not wanting that increased interest is being taken in the seeds as a therapeutic agent in this country. It was recently reported that the demand in the United States was in excess of supply and that imports from South Europe had increased to a surprising degree.

It is to the peculiar property of secreting a large quantity of mucilage on being placed in water that the seeds owe their medicinal value. The presence of the mucilage renders the seeds demulcent and emollient and they are used in cases of catarrh, dysentery, and other inflammatory disorders. Other seeds secreting mucilage in a similar manner and employed in internal medicine are Flax, Sesamum and Ispaghul Seed (*Plantago ovata* Forsk.). Apart from medicinal uses Psyllium Seeds are employed to some extent in Europe in the preparation of dressings for textiles, particularly for silk fabrics, muslin and lace. The dressings are prepared by boiling the seeds for some time with the requisite quantity of water. The mucilage from the seeds has also been used for toilet purposes as a bandoline.

The production of the mucilage, which is perfectly clear and of a jelly-like consistency when formed in the presence of a limited quantity of water, is due to the action of water or aqueous fluids on the superficial cells of the seeds. It is located principally in the surface layers of the seed coat, the seeds containing up to 15 per cent. of mucilage. In contact with water the surface-cells first swell considerably, and finally burst, forming a mucilaginous mass. When administered internally the seeds reach the intestines in a condition exactly suitable for emulsification and are claimed to fulfil a dual role. The liberation of the mucilage of the seeds and emulsification of their oils produces a mode of action distinctly laxative, while the mechanical action of the seeds themselves is to facilitate the division of the food-mass and to excite secretion of the gastric juice without in any way impoverishing its digestive power.

Plantago Psyllium is native to the Mediterranean region and extends eastwards into Persia. It appears to favour dry sandy soils, and is often of a semi-trailing habit. The small globose inflorescences, each of which produces about a dozen of the brown boat-shaped seeds, are borne in the axils of the leaves. The whole plant is somewhat sticky owing to its entire surface being covered with minute glandular hairs. In common with other members of the genus this species grows freely and can be cultivated with a minimum of trouble provided suitable localities are chosen. It grows so readily in its native habitat that it is frequently to be seen as a weed growing up through the ballast of railway tracks. In cultivation a dry sandy soil is generally chosen. After it has been well worked, in some cases harrowed and rolled, small furrows are made at distances of about 60 centimetres. Along these furrows the seed is sprinkled and lightly covered. During the growth of the crop it is usually sufficient for weeding and cultivating operations to be performed once or twice only. The period of harvesting varies according to locality but is generally in August. The whole plant is harvested and after drying the liberation of the seeds is assisted by threshing.

During last summer the plant was under cultivation in the Herbaceous Ground at Kew and fruited profusely, the seeds being of good quality and colour. Genuine *Psyllium* Seeds are brown in colour, though an inferior pale-coloured form is occasionally to be met with in commerce. The pale-coloured seeds are cheaper than the brown but are deficient in mucilage and are regarded as of little value for medicinal use. The sudden appearance of the plant as a member of the alien weed flora of South Australia some years ago caused a certain amount of alarm* at the time, for it was feared the plant would spread and prove troublesome as a weed. F. N. H.

The Dispersal of Plants throughout the World.†—Mr. H. N. Ridley's monumental volume occupies, with the copious and excellent index and biography, 744 closely printed pages. There are also twenty-two useful plates, one being in colour, showing various methods of dispersal of seeds and fruits, in the delineation of which the author has been ably assisted by Miss M. B. Moss. The volume is divided into twelve chapters, some of which are further subdivided into parts, each being devoted to some particular adaptation or type of dispersal. The following list of chapter headings, with their subdivisions, gives an adequate idea of the scope and comprehensiveness of the work, which will prove of immense value to all botanists and students of plant distribution :—

Dispersal by Wind—Without special modification ; By special adaptations.

By Water—Rain-wash ; Ice, Stream, River and Flood ; Sea.

*Journ. Agric. South Australia, 1916, pp. 360-362.

† By H. N. Ridley. L. Reeve & Co., Ltd., Lloyd's Bank Buildings, Ashford, Kent, 1930. pp. xx+744, pl. 22. Price 63s.

By Animals. By Birds—Attraction by Colour ; Transformation of Berry to Capsule and Vice Versa ; The Aril ; Compound Fruits ; Dissemination of Dry Seeds and Grain by Granivorous Birds ; The Distribution Due to Birds ; List of Frugivorous Birds ; Birds' Nests.

By Reptiles, Batrachians, Fish, Insects, Etc.

Dispersal by Simple Adhesion.

By adhesion through special modification and by adhesion due to viscid exudation.

Dispersal by human agency. Mechanical Dispersal. Island Floras. Dispersal of Orders and Genera.

It is scarcely possible to review in any detail a book which covers such a vast field, and which is of all the more value since its much-travelled author has been able to include so many details of his own observation. Nor is it perhaps fair to offer any remarks of a somewhat critical nature in connection with a book in which such a mass of valuable information is collected together. A word, however, may be said with regard to the American origin of the Coconut, since Mr. Ridley upholds Cook's theory of its American origin, which is now generally considered untenable by the majority of botanists. Then again it is unfortunate that no reference is made to Dr. E. D. Merrill's interesting account of the introduction of Central American plants to the Philippine Islands by means of the annual Acapulco galleon, to which is due the presence of a large number of American plants around Luzon at the present day, and of the reverse process by the same means.

Mr. Ridley makes some interesting remarks on dry dehiscent fruits becoming baccate (pp. 422, 423), and cites the New Zealand *Gaultherias* among his examples. In some of these cases, however, he has not referred to the possibility of hybridisation, for it is now recognised that *G. fagifolia* is a hybrid between *G. oppositifolia* and *G. antipoda*, while a multiplicity of hybrids exists between all the New Zealand species showing every gradation from dry to fleshy "fruits."

These, however, are only minor points, and one can say with all sincerity that we owe a deep debt of gratitude to Mr. Ridley for having brought together such a mass of information in a volume which will serve as an invaluable work of reference for all time, and which will be a stimulus to all those who are concerned with trying to solve enigmas presented by the present distribution of plants throughout the world.

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